ECONOMICS OF COMMERCIAL PRODUCTION AND UTILISATION OF MEDICINAL RICE (*Oryza sativa* L.) NJAVARA

By
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Thesis submitted in partial fulfilment of the requirement for the degree of

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DECLARATION

I hereby declare that the thesis entitled **"Economics of commercial production and utilisation of medicinal rice (*Oryza sativa* L.) Njavara"** is a bonafide record of research work done by me during the course of research and the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other university or society.

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CERTIFICATE

Certified that this thesis, entitled "Economics of commercial production and utilization of medicinal rice (*Oryza sativa* L.) Njavara." is a record of research work done independently by Mr. V.Jayakumar, under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, fellowship or associateship to him.

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Date : 23.3.04

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My ACHAN AND AMMA

AKNOWLEDGEMENT

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Introduction

INTRODUCTION

The second half of 20th century is marked by a renewed interest in plant based drugs all over the world. Simultaneously there has been a steady increase in demand for herbal drugs containing medically useful compounds.

India's glorious tradition in health care dates back to the time of Charaka (1500-1000 B.C.) and Agasthya (1500-1200 B.C.). The Indian system of medicine, particularly Ayurveda and Siddha has achieved high level of development. The promotive, preventive, rejuvenative and curative approach in health care is the major strength in Ayurveda.

Kerala, the land of Ayurveda is often projected at international arena in that context. Among the rejuvenating treatments in Ayurveda '*njavarakizhi*' assumes a pride of place. In this, the traditional rice cultivar '*njavara*', indigenous to Kerala, is used along with several herbs and milk. The growth of tourism sector (health tourism) in the state will be reflected as higher demand for medicinal herbs through backward linkages.

Simultaneously, rice production in the state is at cross roads. Large tracts of rice fields are being converted for non rice purposes leading to ecological imbalance. In view of the potential demand, *njavara* can be extended to more areas where it can be successfully grown. However, technical feasibility may not ensure economic or commercial viability. Studies in the marketing of medicinal plants in the state highlights an oligopolistic market situation which is ruled by a few traders and few major user industries.(Suneetha ,1998; Joseph ,2001)

Moreover, the major marketing channel is identified as the one through the traders who act as a strong link between producer and user industry. As in the case of most of the crops, the producer here is a price taker, with little bargaining power. So the information on the cost of production of the crop is crucial, to assess its relative economics and financial viability.

Njavara is reported as an endangered rice cultivar (MSSRF, 2001). In the context of extension of Intellectual Property Rights to agricultural sector, and India being a signatory to GATT, conservation, characterization and registration of indigenous bio resources are of prime importance to protect the 'Sovereign Rights on biodiversity'. Considering these points this study was proposed with the following specific objectives:

1) To assess the economics of production and marketing prospects of medicinal rice *njavara*
2) To document the Indigenous Technical Knowledge (ITK) associated with its cultivation and use.

1.1.SCOPE OF THE STUDY

So far no studies have been made on the economics of production marketing and profitability aspects of *njavara*. Thus, the present study is a modest attempt to fill this void. The results of present study will be useful to the planners and policy makers of the state to chalk out suitable promotional programmes for this endangered rice cultivar.

1.2.LIMITATIONS

The basic statistics on the extent of coverage of the crop is not available. Hence it was gathered from all possible sources. However chances of omission cannot be fully ruled out. Results of the study are based on the farm level data, generated through sample survey. Information and data relating to costs and returns were elicited from the memory of the respondents. However, every effort was made to minimize the errors by cross questioning and cross checking.

1.3.PLAN OF THE THESIS

This thesis is divided into five chapters including the present one. The second chapter deals with review of related studies. The third chapter deals with the methodology used for the generation of the primary data and analytical tools and techniques employed. The results and discussion of the findings is presented in the fourth chapter. Chapter fifth summarizes the findings, followed by references and abstract.

Review of literature

2. REVIEW OF LITERATURE

Njavara is an endemic rice cultivar of Kerala. So the studies related to it are confined to Kerala State.Earliest literature on the cultivation and medicinal use of *njavara* is seen in the traditional textbooks of Ayurveda (*Astangahridaya* and *Sahasrayoga*). Agronomic, morphological, biochemical and nutritional studies on *njavara* has been attempted to a limited extent

The first scientific report on *njavara* was made by Elsy et al (1992) describing the morphophysiological characteristics, duration (69 days) and yield (2.5 tonnes/hectare). Later, Menon and Potty (1996) initiated scientific work on the crop and identified two biotypes (black and golden glumed) and suggested further investigations. Menon (1996) studied the effect of location on yield and quality of the crop. It was found that the amino acid content was higher (indicator of quality) in uplands *njavara* while it was the lowest in wet land crop. The reverse was the case with yield. Reddy (2000) described the morphological characters of *njavara* and classified the genotypes into 13 distinct groups. All these studies suggested areas, which need further exploration.

M.S. Swaminathan Research Foundation (Regional Station, Kalpetta, Wayanad) has initiated the action for the collection and conservation of the germplasm and they have released a handbook providing the basic features of the crop.

Studies on the economic aspects of *njavara* are not attempted so far. However the volume of recent reports in medicinal plant sector evidences the research interest in the economic and marketing aspects of medicinal plants.

Researchers in various parts of the world studied the international market for medicinal plants. Abu and Ismail (1995) in Egypt, Brevoort (1996) in U.S., Suran and Narayanan (1996) in European community, Tsutsui and Saiprasert (1996) in Northern Thailand, Velvert (1996) in France, Hersh (1997) in Mexico and Cunningham (1999) in Africa are a few to cite in this aspect.

Being a biodiversity rich zone, Asian market for medicinal plants attracted much attention of researchers. Studying the medicinal plant market Ghosh (2000) reviews that 90 per cent of the raw drug material is produced in Asia, Africa and Latin America and the rest 10 per cent in Europe and U.S.A. More than 90 per cent of the marketed materials are collected from wild resources and there is some cultivation in China, India, USA, Germany, France, Italy and Eastern Europe. More than 60 per cent of the collected material was imported and processed in USA, Canada, UK, Australia, Germany, France, Italy, Switzerland and Japan. About 50 per cent of the products are used there itself and the rest is exported to the raw material producing countries to be sold at high rates.

Thomas *et al* (1999) made similar observation on the trade of medicinal plants and related sector in India. The fluctuations in the national and international prices on account of variable supply and demand cause many problems in the industry. India can achieve comparative advantage in this sector by producing low volume high cost medicines through value addition of the raw and unfinished products.

Some specific studies on medicinal plants sector in Kerala projects the market situation in the state. Kerala Forest Research Institute (1993) conducted an extensive study and identified 300 plant species found in Kerala forest, which had commercial use as medicinal plants. Forest department had given permission to collect only 120 items from forest, to tribes and tribal communities. Out of these 120 items, 73 are listed as medicinal herbs for ayurvedic industries, which consist of 22 roots, 19 tubers, 16 creepers and the rest, spikes, bark etc. The value of minor forest produce collected by the tribal communities increased from Rs.15 lakhs during 1982-83 to Rs.96 lakhs during 1991-92.

Thomas and Sankaranarayan (1993) studied marketing arrangement for Non Timber Forest Produces (NTFP) in Kerala, which includes a variety of medicinal plants. Private traders have been enjoying monopoly status in collection and marketing of NTFP(Non Timber Forest Produces) from the forest areas up to, 1997-98. Since 1998, the Government has entrusted the right of collection of NTFP to the

tribals and forest dependent people from reserve forests and marketing to the Girijan Service Co-operative Society (GSCS) on concessional lease rent. The NTFP collected by the GSCS will be sold to the SC\ST Federations at prices fixed up by the NTFP committee. The committee has to fix collection charges, procurement value and the sale value of the collected materials. Nearly 75 per cent of sale value is given as collection charges to Girijans, 15% as commission charge to GSCS and 10% to SC\ST Federation.

Surveying 147 pharmaceuticals of Kerala in a one-year period, Sankaranarayanan (1995) has identified the major plant / plant part required by the industry. The leaves of *Adhatoda vasica* are required to the tune of 1238 tonnes, followed by *Tinospora cordifolia*(1106.62 tonnes) and *Cynadon dactylon*(537.73 tonnes).In the case of roots,*Sida rhombifolia* is required to the tune of 1917.47 tonnes followed by *Ricinus communis*(883.73tonnes), *Ichinocarpus fruitiscens* (564.12tonnes) ,*Hemidesmus indicus* (529.11 tonnes)and *Aegle marmelos* (524.01tonnes) The whole plant of *Eclipta alba* is required to the tune of 261.35 tonnes and the shoots of *Azadiracta indica* were in demand to the tune of 660.34 tonnes.

Sankar (1996) has analysed the marketing channels and costs of medicinal plants in Thrissur district and reported that more than 50 per cent of medicinal plants used by the pharmacies are collected from the wild, by the gatherers. While the plant collected and sold is not reflected its true value in the market price. Further, the margin of the traders are quite high compared to the share of gatherers.

Mayadevi (1996) studied the economics of production and marketing of selected medicinal plants in Thrissur district, reported that there are three major channels identified in Kerala, of which the producer-dealer-ayurvedic medicine manufacturer is the channel through which bulk of the produce was marketed. Nearly 57 per cent of the respondent farmers of kacholam sold their produce to medicinal plant dealers, 33.3 per cent sold through amrutha and rest 10 per cent sold their produce directly to ayurvedic medicine manufactures. In the case of koduveli 58.33

per cent sold their produce to medicinal plant dealers, 25 per cent sold through amrutha and rest 16.67 per cent sold their produce directly to ayurvedic drug manufacturer. The producers share on dealer price was Rs.69 per kilogram (83.3 percent) for kacholam and Rs. 20 per kilogram (83.3 percent) for koduveli. The index of marketing efficiency was 11.5 for kacholam and 7 for koduveli indicating the economic efficiency of marketing of kacholam was more, compared to koduveli. Her study revealed that the largest single item of input was human labour in koduveli and seeds in kacholam.

Suneetha (1998) has identified ten major medicinal plants based on the descending order of the magnitude of the quantity procured by six sample ayurvedic pharmacies in Kerala. The major ten plants identified are1) *Sida spp. 2) Tinospora cordifolia 3)Asperagus racemosus 4) Aegle marmelos 5)Phyllanthus emblica 6)Terminalia chebula 7)Withania sominifera.8)Strobilanthes ciliatus 9)Cuminum cyminum 10)Adhatoda sp.* In her study the pharmaceutical demand for ten medicinal plants, marketing channels, price spread in the major marketing channel and percentage composition of the medicinal plants in major medicines were analyzed. The major marketing channels identified are 1) collector-ayurvedic medicine manufacturer.2) collector-traders- ayurvedic medicine manufacturer 3) collector-commission agent- trader- ayurvedic medicine manufacturer 4) trade in North India-trader in Kerala- ayurvedic medicine manufacturer 5) collector-tribal society-end user. Among the marketing channels, collector-traders- ayurvedic medicine manufacturer is the channel through which major portion of the medicinal plants are marketed in the state.

Sasidharan and Muraleedharan (2000) studied the ayurvedic drug units in Northern Kerala and assessed the consumption of raw drugs by the manufacturing units, their source of supply and dependency on forests. The annual consumption of 140 raw drugs is estimated to be 11,350 tonnes, of which 83 per cent is consumed by large units ,6 per cent by medium units and 11 percent by small units. Of this,16 items are used over 200 tonnes, 21 items between 200 and 100 tonnes, 23 between

100 and 50 tonnes, 20 between 50 and 25 tonnes, 23 between 100 and 10 tonnes. The medicine manufacturing units get raw drugs collected from forests, nonforests and through imports. Among the 140 raw drug items, 117 are naturally seen in Kerala and in neighboring states of Tamil Nadu and Karnataka. The consumption of raw drugs collected from forests is 44.94 per cent, non-forest areas 14.31 per cent, cultivation 13.58 per cent and imports 7.39 per cent.

Joseph (2001) analysed the market economy of medicinal plants in Kerala and reported that only a few traders handled bulk of the trade of medicinal plants. Export of Ayurvedic plants increased steadily and formed a major item of foreign exchange. The major ten species of medicinal plants were selected based on the magnitude of quantity procured by those seven major pharmacies. The annual compound growth rate of the medicinal plant consumption varied from 4.19 to 9.31 per cent and the coefficient of variation in their prices ranged from 8.62 to 29.89 per cent. Price elasticity of all the medicinal plants studied were positive, varying from 0.33 to 3.31 per cent . Six major channels for medicinal plants were identified in Kerala. Tribal-commission agent -traders/dealer- ayurvedic medicine manufacturing unit is the main marketing channel through which majority of the medicinal plants marketed in the state.

The demand for medicinal plants by the user industries in Kerala are estimated at different spatial and temporal planes by Sankaranarayanan (1995), Sankar (1996), Suneetha (1998), Pusphangadan et al (1998), Sasidharan and Muraleedharan (2000) and Joseph (2001). Suneetha (1998) and Joseph (2001) have made a detailed analysis of the marketing aspects of important plants traded and estimated the demand and level of scarcity. Their study has highlighted the oligopolistic nature of the medicinal plant market where a few traders act as market leaders and influence price fixing.

Thomas (2000) also reported the major role of traders in the marketing. Fifty eight percent of the cultivators in Thiruvananthapuram district sold their produce to

the dealers where as it was only 16 per cent who sold direct to pharmacies. Similar case was reported by Mayadevi (1996) in Thrissur district.

Ravisankar (1993), Farooqi and Vasundhara (1997) and Suneetha (1998) have made attempts to estimate the economics and have reported the profitability as attractive. In this context the cost of production of medicinal plants assumes importance when they are cultivated. But the studies on production aspects of medicinal plants are very few, and this study would be maiden attempt in the case of *njavara.*

Review of studies on the production aspects of paddy in Kerala is attempted in view of the similarity of the crop with other cultivars of rice.Scanning through the literature since 1980, the study by Muraleedharan (1981) on resource use efficiency in rice cultivation in low lying areas of Kerala, appears first. This study highlights the inefficient utilization of resources (human labour, bullock labour and fertilizers) in rice production in kole lands, Thrissur district. This is followed by a similar study in Kuttanad by Joseph (1982).

Radhakrishnan (1983) did a comparative economic study of paddy production in the three major producing centres of Kerala, viz. Palakkad, Thrissur and Alappuzha. He reported a sharp decline in relative and absolute profitability since 1974-75 in all the three districts. This had a depressing effect on paddy land prices, which resulted in conversion of paddy lands. Thomas etal (1991) did a similar study in Thrissur district and made similar conclusions.

Analyzing the economics of paddy in kole lands, Thomas (1992) high lighted the share of human labour in total cost, both in local and HYV. Babu (1992) also attempted to estimate the cost structure of paddy in Thrissur district, focussing on the economies of scale. The cost of cultivation varied inversely with size of holding. Further among the three crops taken (*virippu*, *mundakan* and *puncha*), the cost was highest in *puncha*. Lakshmi (1993) also established the inverse relation between cost and size of holding in paddy cultivation in Kuttanad area. This was reflected in the BC ratio as well.

Further, the study by Santha (1993) reported the lowest net income in *punja* crop compared to the other two in paddy in Thrissur district. This is in conformation with the reports of Babu (1992) who attempted to estimate the cost structure of paddy in Thrissur district focussing on the economies of scale.

Mohandas (1994) did a detailed comparative analysis of rice production in Kuttanad and Kole areas. The BC ratio was estimated at 1.19 for Kuttanad and 1.09 for Kole lands.

Bastine et al (1994) analyzing the growth trends of principal crops in Kerala reported that rising operational cost due to high wage rate was an important factor in the decline in the area under rice cultivation. The other factors that can be attributed for conversion of paddy lands are problems in labour management, production and yield risk, higher profitability associated with the conversion to coconut and also for non-agricultural purpose.Later on, the studies by Krishna et al (1996), Thomas et al (1996), Vijaya (1998), Rakhesh (1999), Suresh (2000) and Mathew (2001) also confirmed the findings of Bastine and Palanisami (1994) as their reports highlighted the high share of labour in the total cost of cultivation.

The socioeconomic forces that act against paddy cultivation in the state result in sharp decline in area under the crop and conversion of paddy land for non paddy purpose which lead to several social, economic and ecological affects. In this context the estimate of relative profitability of *njavara* assumes importance, as a promising crop in paddy fields at least in certain areas.

Materials and Methods

3. MATERIALS AND METHODS

Unlike other crops in Kerala, systematic collection and reporting of statistics is lacking in medicinal plants. Hence scientific information relating to its extent of coverage, major centers, growers etc is limited. So, for the preparation of sampling frame, relevant information was gathered and compiled from various sources like Department of Agriculture, medicinal plant traders, Ayurvedic drug manufacturing units, M.S.Swaminathan Research Foundation and National Bureau of Plant Genetic resources. It was understood that the crop acreage is more in the districts of Palakkad, Thrissur, Malappuram and Wayanad. Contacting further the Krishibhavans, medicinal plant traders and ayurvedic drug manufacturing units of the districts the sampling frame was evolved. From this, a random sample was chosen. The sample size from each district was in proportion to the total number of farmers (growing *njavara*) in that district, fixing the total sample size to a minimum of 60.Since *njavara* is not considered as a food crop, its cultivation is not widespread. For the purpose of identifying the respondents, farmers cultivating *njavara* for the past few years continuously are only considered. Recent entrants in this crop enterprise are not included.

3.1. COLLECTION OF DATA

The information on production economics was collected using structured, pre-tested questionnaire by personal interview method (Appendix:1).The questionnaire was developed and refined after a pilot study. Details on socio-economic profile, input use, price of inputs, output level, price of output, method of sale, marketing channels and indigenous knowledge were collected.

The marketing aspects were collected from producers, market intermediaries and end users by personal interview method.

The indigenous knowledge on production and consumption were gathered from the producers, traditional vaidyas, ayurvedic medical practitioners and elderly people in the locality and properly documented.

3.2. PERIOD OF STUDY

The data pertained to the mundakan season of the year 2002 and the collection of data was carried out during the period April 2003 to June 2003.

3.3.ANALITICAL FRAME WORK

Commission for Agricultural Costs and Prices, Government of India has suggested a methodology for estimation of cost of cultivation of all important crops in the country. The method employs the concepts of Cost ABC which is detailed below.

3.3.1. **Cost concepts**

The Estimation committee on cost of cultivation has categorized the farm costs into six groups viz., Cost A_1, Cost A_2, Cost B_1, Cost B_2, Cost C_1 and Cost C_2. In addition, Cost C_3 has been added later in 1991 to account for the management input of the farmer. These cost concepts are outlined as below.

(i) *Cost A_1*: approximates all actual expenses incurred in production by the owner operator. It includes the following items.

(a) Value of hired human and machine labour

Human labour employed for various cultural operations like land preparation, sowing, harvesting and post harvest handling were included in determining the value of hired human labour. The actual wages paid for labour was considered as value of hired labour. The average wage rate prevailing in Thrissur, Palakkad, Malappuram and Wayanad districts for male labour were Rs.150, Rs.80, Rs140 and Rs.120 respectively where as for female the wage rate were Rs.70, Rs.45, Rs.65 and Rs.60.The mandays are estimated based on the male- female wage rate ratio in the respective districts.

(b) Value of material inputs

Expenditure on all material inputs like seeds, manures, fertilizers and plant protection chemicals was estimated on the basis of their market price. The market rate was imputed for those items, which were not, purchased (farm-produced inputs). The expenses for manures, fertilizers, plant protection chemicals are not included in the cost of cultivation, as they were not applied for njavara.

(c) Interest on working capital

This was charged at the rate of 11.25 % per annum which was the interest rate charged by commercial banks on short tem agricultural loans. It was taken only for half the duration of the crop since all the costs were not incurred at the beginning.

(d) Land Revenue

The actual rate paid to the revenue department was taken as the land revenue. It was Rs.500 per hectare per annum and was apportioned for the duration (3 months) of the crop/ proportionate acreage under the crop. Hence the amount is taken as Rs.125 per hectare for the crop.

(e) Depreciation of farm implements/machinery

The depreciation charges are not included because labourers generally brought their own implements to the field and the wages they got included the rent for implements too.

(ii) Cost A_2

Cost A_2 is equal to Cost A_1 plus rent paid for leased in land. In the area under study leasing of land by the respondent was not found. Hence CostA_1 is same as Cost A_2.

(iii) Cost B_1

It is equal to Cost A_1 plus interest on value of owned capital assets (excluding land) which included iron and wooden implements, machinery such as diesel and electric motors etc. Farmers generally do not use their own fixed capital in rice cultivation and so Cost B_1 is same as Cost A_1.

(iv) *Cost B_2*

It is equal to Cost B_1 plus imputed rental value of own land. Rental value of own land was an amount equal to $1/6^{th}$ of the value of grain yield per crop.

(v) Cost C_1

It is equal to Cost B_1 plus imputed value of family labour.

(vi) Cost C_2

It is equal to Cost B_2 plus imputed value of family labour.

(vii) Cost C_3

It is equal to Cost C_2 + 10% of Cost C_2 to account for managerial remuneration to the farmer.

(viii) Cost of cultivation

Cost of cultivation refers to the total expenses incurred in cultivation per hectare. Cost of cultivation both inputwise and operationwise were worked out.

(ix) Cost of production

It is the cost incurred to produce per unit of the output. The produce is sold at the farm premises to the trader/ commission agents of traders. So the farmers do not incur any expenses towards marketing.

3.3.2. **Income measures**

The following income measures associated with different cost concepts were used to measure the efficiency.

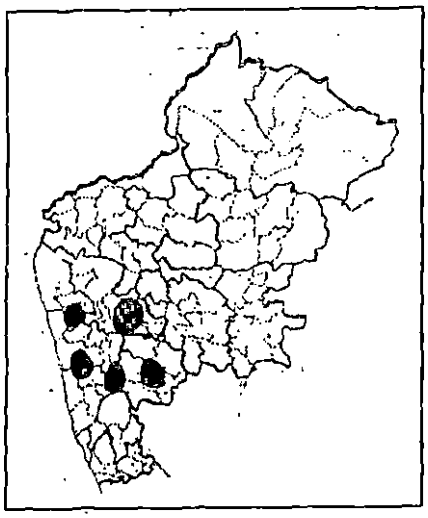
i) *Gross income*:

It represents the total value of the produce (both grain and straw) which were valued at the prevailing market price. Those amounts taken for home consumption as well as wage payments in kind were also valued at this rate. This reflects the total revenue realized from the enterprise.

ii) *Farm business income*: Gross Income-Cost A_1.

This reflects the returns over paid out cost. Farmer's level of decision making is most often based on farm business income.

Fig. 1. Map of Kerala State showing the study area



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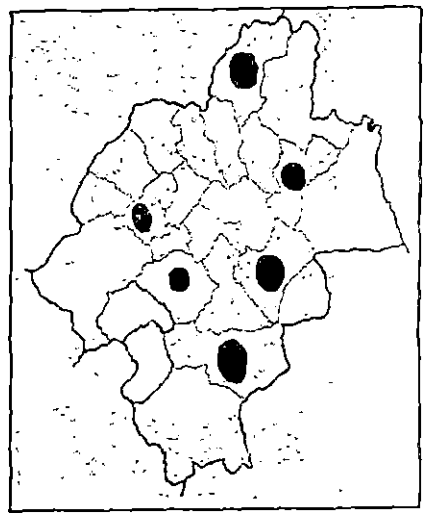

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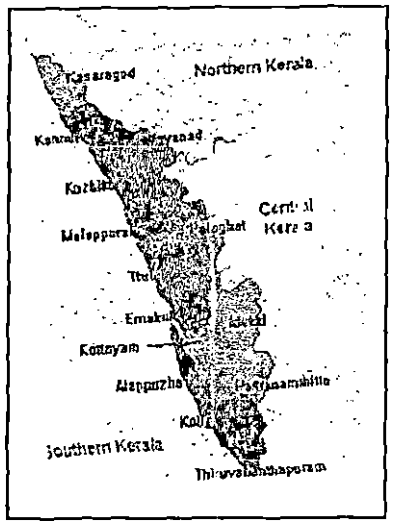

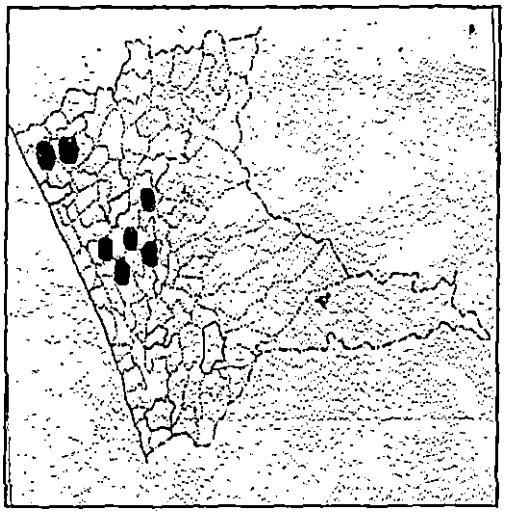

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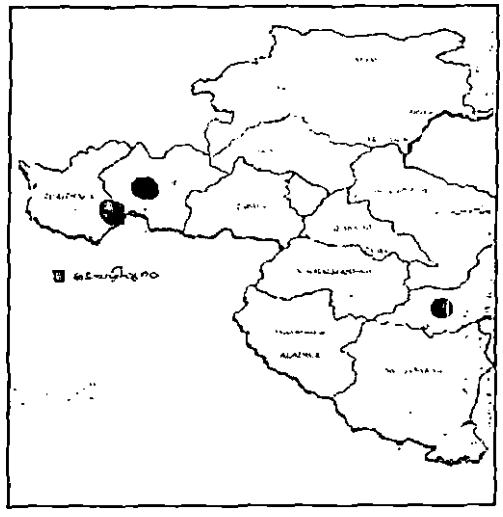

PALAKKAD

iii) ***Own farm business income***: Gross Income-Cost A_2.

When the enterprise is run in leased land the return realized after paying the rent reflects this.

iv) ***Family labour income***:

Gross Income-Cost B_2 or Net income + imputed value of family labour. It reflects the return to family labour along with the net income.

v) ***Net income***: Gross income-Cost C_3

vi) ***Farm investment income***: Farm business income-imputed value of family labour.

3.4.BENEFIT COST RATIO

It reveals the economic efficiency of production. It was calculated by dividing the total benefits by the total costs (undiscounted).

3.5. AREA OF STUDY AND SAMPLE PROFILE

In this section a general description of the study area is furnished. The socioeconomic and climatic factors that has a direct relevance is highlighted .A map of Kerala state demarcating the study area is provided in figure 1.

3.5.1. **General Features**

3.5.1.1.***Total population***

The total population of the four districts revealed that Malappuram is the most densely populated district with a population of 36.29 Lakhs whereas Wayanad is the least densely populated district with a population of only 7.86 Lakhs. But the sex ratio is the highest in Thrissur (1092) followed by Palakkad (1068). The average density of population of Kerala is 749 per square kilometer and sex ratio is 1040.

Table3.1. The total population of the four districts (2001)

District	Population			Sex ratio Female per 1000 male	Population Density (Per sq.km.)
	Total	Male	Female		
Thrissur	2975440	1422047	1553393	1092	981
Palakkad	2617072	1265794	135 ,278	1068	584
Malappuram	3629640	1759479	1870161	1063	1022
Wayanad	786627	393397	393230	1000	369

Source:Farm Guide,2002

3.5.1.2.***Distribution of cultivators and agricultural labourers.***

In the study area ,Wayanad district has the highest percentage of cultivators (17.91percent)of the total workers. It was followed by Malappuram (13.15percent) and Palakkad (12.37percent) districts where as in Thrissur district only 9.20 percent of the total working population are cultivators. The state average distribution of cultivators is only 12.24 percentage.

Tables 3.2. Labour force in the study area

Districts	Cultivators	Agricultural labourers	Percentage of cultivators to total workers	Percentage of agricultural labourers to total workers
Thrissur	74064	183588	9.20	22.81
Palakkad	97289	348299	12.37	44.29
Malappuram	88291	227708	13.15	33.91
Wayanad	40729	74813	17.91	32.89

(Source: Census report 1991)

The total labour force available in agricultural sectors is reported as 25.54 percent of the total work force in Kerala. Among the four districts, Thrissur has the highest number and Wayanad the lowest. But the proportion of agricultural labour force to total workers is the maximum in Palakkad and minimum in Thrissur.

3.5.1.3.***Rainfall***

Compared to other rice varieties, *njavara* cannot withstand water level above10 centimeters.. *Njavara* can be cultivated in all the three seasons (*virippu, mundakan and puncha*) depending on the facility for water management. In Palakkad, Malappuram and Thrissur districts it is usually cultivated in *mundakan* season. However, Kole areas it is *puncha* .In Wayanad the crop cultivated in *mundakan* & *puncha* seasons. Usually it is not cultivated in *virippu* season because of water logging. The rainfall data supplements the information.

Table3.3.District wise monthly rainfall data (mm)

Month	District			
	Thrissur	Palakkad	Malappurm	Wayanad
January	0	0	13	14
February	16	29	4	14
March	2	3	1	0
April	66	85	76	118
May	98	43	81	58
June	590	508	592	608
July	334	291	319	378
August	566	464	443	626
September	132	160	248	250
October	203	131	275	122
November	41	83	59	44
December	26	34	80	112
Annual	2074	1831	2529	2344

Source:Farm Guide 2002

3.5.1.4. ***Rice Economy in the study area***

Palakkad district; the 'rice granary' of Kerala, occupying 11.3 percent of the total geographical area of the state, accounts for 30.5 percent of the total rice production. When the total net rice area sown is considered, Palakkad district ranks first (32.6 percent) among the fourteen districts of the state. *Virippu* and *mundakan* (2^{nd} crop) together account for more than 94 percent of the total rice area in the district. At the state level, the HYV coverage during *virippu* and *mundakan* seasons are 43.07 percent and 36.71 percent respectively, whereas for Palakkad district, the corresponding figures are rather low (21.0 percent and 23.77 percent respectively). The gross HYV coverage in Kerala is around 45.74% where as in Palakkad it is only 21.82% (FIB, 2000) Apart from the predominant normal rice cultivation practices, three other unique traditional systems of growing rice namely *koottamundakan* (Ottappalam taluk), *karingora* (Pattambi and Thrithala blocks) and *poonthal padams* (Pattancherry and Muthalamada blocks) are also found in Palakkad district .

In Thrissur, generally rice is grown in *virippu* and *mundakan* season in uplands where as in lowlands like Kole, *puncha* is the main crop.The kole lands are spread over Thrissur and Malappuram districts. The fields are geographically distributed in Mukundapuram, Chavakkad and Thrissur taluks of Thrissur district and Ponnani taluk of Malappuram district.

In Malappuram, rice is grown in *virippu, mundakan* and *puncha* seasons, But area under rice is more in Mundakan season and in Wayanad rice is grown in *mundakan* and *puncha* season and *mundakan* is the major rice growing season.

The coverage of HYV in rice production is reported at the level of 45.74 percentage of the net cropped area of rice in Kerala.. Though Malappuram is generally categorized as a socio-economically backward district, the adoption of high yielding variety for *virippu* and *puncha* season is found to be highest among the four districts .In *mundakan* , Wayanad district has the highest area under HYVs (table 3.5). Along with this *njavara* cultivation is more concentrated in Wayanad district (6.18 hectare), generally during the *mundakan* season. The higher coverage of *njavara* in Wayanad

Table3.4. Trends in area, production and mean yield of rice in study area.

	Season	Thrissur		Palakkad		Malappuram		Wayanad	
		1975-76	1999-00	1975-76	1999-00	1975-76	1999-00	1975-76	1999-00
Area (hectare)	*virippu*	34566	11343	100835	51685	50596	5844	-	-
	mundakan	59493	23622	82211	50730	36154	15440	-	14554
	puncha	14319	7922	2136	7289	6203	2211	-	2750
Production (Tonnes)	*virippu*	39987	21488	205018	106137	70294	10230	-	-
	mundakan	77996	51132	165741	123292	49417	25677	-	37783
	puncha	21799	19589	3460	21482	10652	6210	-	6978
Mean yield (kilogram per hectare)	*virippu*	1761	2883	3095	3126	2115	2664	-	-
	mundakan	1995	3298	3068	3699	2080	2531	-	3951
	puncha	2317	3764	2465	4486	2614	3862	-	3862

Source: Farm Guide , 2001.

district can be attributed to active role of M.S.Swaminathan Research Foundation. In other districts there are no institution to coordinate the *njavara* farmers

Table3.5. Season wise area under paddy (high yielding and local varieties in three seasons) in the districts of Thrissur, Malappuram, Palakkad and Wayanad (hectare).

Sl No	District	Season	High Yielding varieties	%	Local Variety	%	Total	%
1.	Thrissur	Autumn	3564	31.42	7779	68.58	11343	100.00
		Winter	7911	33.49	15711	66.51	23622	100.00
		Summer	6919	87.34	1003	12.66	7922	100.00
2.	Palakkad	Autumn	19608	37.94	32077	62.06	51685	100.00
		Winter	22394	44.14	28336	55.86	50730	100.00
		Summer	5828	79.96	1461	20.04	7289	100.00
3	Malappuram	Autumn	4182	71.56	1662	28.44	5844	100.00
		Winter	4127	26.73	11313	73.27	15440	100.00
		Summer	2124	96.07	87	3.93	2211	100.00
4	Wayanad	Autumn	-	-	-	-	-	-
		Winter	9229	63.41	5325	36.59	14554	100.00
		Summer	2586	94.04	164	5.96	2750	100.00

Source: Farm Guide ,2002.

Njavara cultivation in each district is concentrated in certain pockets. In Thrissur its cultivation is confined to areas like Panamukku, Cherpu, Pudukkadu, Ammadam, Koodanur, Shasthamkadavu, Perumpullissery, Venginissery, Mannuthy, Kunnamkulam, Paralam, Nettissery, Perumpadappu and Katambhala. In Palakkad its cultivation is concentrated in Pattambi, Koottanad and Chittoor areas. In Malappuram it is in Thavanur, Thirur, Kottakkal, Thripankode and Thirunavaya, areas. While in Wayanad, it

is confined to Mananthawady, Kalpetta, Sulthanbatheri, Meenangadi, Varadoor, Panavalli, Thondernadu, Puthusserikadavu, Mappedy and Vythiri areas.

3.5.1.5 ***Ayurvedic Drug Manufacturing Units***

The major use of *njavara* is found to be in ayurvedic industry. So the details regarding the spread of ayurvedic industry in these districts were collected and is presented in table3.7.There is more concentration of user industry in Thrissur district .In Wayanad the industrial units are very few. But the studies on marketing have shown that the predominant marketing channels for medicinal plants are through traders. So the presence or absence of user industry does not affect the production much.

Table3.6.Registered Ayurvedic Medicine Manufacturing Units in the four Districts

Districts	Small (<1 crore)	Medium (1-3crores)	Large (>3 crores)	Total
Thrissur	114	9	7	130
Palakkad	23	11	3	37
Malappuram	28	7	3	38
Wayanad	3	0	0	3

Source: Sasidharan and Muraleedharan (2000)

Results and Discussion

4. RESULTS AND DISCUSION

This chapter is presented under the following subheadings.

1) Profile of sample.
2) Economics of *njavara* cultivation.
3) Marketing.
4) Indigenous Technical Knowledge.

4.1. PROFILE OF THE SAMPLE

The selected farmers were grouped into two size class based on the area under *Njavara* cultivation. The farmers cultivating *Njavara* in less than 50 cents(0.2 hectare) of *Njavara* were grouped as class I and those cultivating 50 cents and above were grouped as class II. The data collected was analysed both based on area under the crop as specified above and district wise. The distribution of sample farmers based on class wise and district wise are presented in the table 4.1.a and 4.1.b. The number of respondents in each district was decided based on the total number of *Njavara* cultivators in that district. Wayanad was found to be having highest number of farmers followed by Thrissur, Malappuram and Palakkad. Majority of the farmers (68.33 per cent) had an area of less than 0.5 hectare under the crop in all districts. The average crop acreage was highest in Wayanad district (0.238) and the lowest in Malappuram(0.085).

Table 4.1.a. **Distribution of sample farmers**

Class group	Districts				Total
	Thrissur	Palakkad	Malappuram	Wayanad	
Class I	11	6	9	16	41
Class II	4	2	2	10	19
Total	15	8	11	26	60

Table 4.1.b. **Area under njavara cultivation of sample farmers.**

Class/district	Total area(ha)	Average area(ha)
Thrissur	1.7	0.113
Palakkad	0.84	0.105
Malappuram	0.94	0.085
Wayanad	6.18	0.238
Class I	2.34	0.057
Class II	7.32	0.408

4.1.1.**Education**

Table 4.1.1 **Educational status of sample farmers**

Education	District				Class		Total (District/ class)
	Thrissur	Palakkad	Malappuram	Wayanad	Class I	Class II	
Illiterate	0	0	0	0	0	0	0(0.00)
Primary	0	1	2	2	4	1	5(8.33)
Secondary	3	2	2	5	7	5	12(20.00)
Higher secondary	6	2	3	12	15	8	23(38.34)
Graduate and above	6	3	4	7	15	5	20(33.33)
Total	15	8	11	26	41	19	60(100.00)

(Figures in parenthesis denote the percentage of total)

The distribution of respondents according to their educational status is summarized in the tables 4.1.1. The analysis showed that none of the farmer was

illiterate. Majority of the respondents had higher secondary (38.34 per cent) and graduate level (33.33 per cent) of education. About 20.00 per cent were educated up to secondary level and 8.33 per cent up to primary level.

4.1.2. Occupation

Agriculture was only a subsidiary occupation for a sizeable proportion (60.00 per cent) of the respondents. It was the only occupation for 30.00 per cent where as it was the main occupation for 10 per cent The distribution of respondents based on occupation is given in the tables 4.1.2.

Table 4.1.2. **Occupational status of sample farmers**

Occupation	District				Class		Total (District/ class)
	Thrissur	Palakkad	Malappuram	Wayanad	Class I	Class II	
Agriculture only	2	4	5	7	11	7	18(30.00)
Agriculture as main occupation	2	-	3	1	3	3	6(10.00)
Agriculture as subsidiary occupation	11	4	3	18	27	9	36(60.00)
Total	15	8	11	26	41	19	60(100.00)

(Figures in parenthesis denote the percentage of total)

4.1.3. Annual family income

The respondents were classified into three income groups based on their family income. Nearly 52 per cent of the respondents enjoyed an annual income between Rs.50, 000 and one lakh rupees. The proportion of respondents who earned less than Rs.50,000 per annum was 26.67 per cent. While 40 per cent of the respondents relied on agricultural activities (either as sole source of income or as main source of income) about 21.66 per cent could enjoy an annual income of more than Rs.1 lakh. The distribution of the respondents based on annual family income is shown in table 4.1.3.

Table 4.1.3.**Annual income distribution of sample farmers.**

Annual family income (Rs.)	Districts				Class		Total (District/ Class)
	Thrissur	Palakkad	Malappuram	Wayanad	Class I	Class II	
<50,000	2	1	1	12	10	6	16(26.67)
50,000-1,00,000	8	4	6	13	23	8	31(51.67)
>1,00,000	5	3	4	1	8	5	13(21.66)
Total	15	8	11	26	41	19	60(100.00)

(Figures in parenthesis denote the percentage of total)

4.1.4. **Size of holding**

Based on the total size of land holding, the respondents were categorized into three groups (table 4.1.4). It revealed that only 16.67 per cent of the farmers have the holding size more than one hectare and rest 83.33 percentage have only less than one hectare.

Table 4.1.4. **Total holding size of respondents.**

Total holding size (hectare)	District				Class		Total (district/ Class)
	Thrissur	Palakkad	Malappuram	Wayanad	ClassI	ClassII	
<1 ha	14	5	7	24	37	13	50(83.33)
1-2 ha	1	3	4	2	4	6	10(16.67)
Total	15	8	11	26	41	19	60(100.00)

(Figures in parenthesis denote the percentage of total)

Plate no.1 *Njavara* seeds

Plate no.2 Tillering stage of *Njavara*

Plate no. 3 Harvesting stage of *Njavara*

Plate no. 4 Panicle of *Njavara*

4.2 ECONOMICS OF NJAVARA CULTIVATION.

4.2.1. Brief description

Njavara is a unique rice cultivar endemic to Kerala. It is characterized by extremely short duration (60 days) and proclaimed medicinal values. Due to its short duration it is known as '*shastika*' in Sanskrit.

The cultivation is generally confined to the high lying paddy fields, where water management is easy. Unlike other paddy varieties *njavara* is water sensitive. It cannot tolerate water stagnation above 10 centimeter for long periods.

Njavara is a direct sown crop, and only rarely transplanting is resorted to. The seeds are soaked for germination and all the related practices are similar to other rice varieties.It is a poor tillering cultivar, with thin culms.

Since *njavara* is not considered as a food crop, its cultivation is not wide spread. Traditionally, *njavara* cultivation is concentrated in certain pockets, and the agronomic practices are standardized over time through constant observation. Manures, fertilizers, and other agro chemicals are not applied for this crop, primarily due to the general belief that it affects the medicinal properties, adversely.

The harvesting of the crop is done with much care as the grains fall off easily. The post harvest operations of *njavara* do not differ from other rice varieties.

4.2.2. Cost of cultivation of njavara (inputwise).

The input wise break-up of the total cost of cultivation of *njavara* crop was worked out based on different cost concepts and is presented in the table 4.2.1.

The cost of cultivation of *njavara* crop under various cost concepts is presented in the table 4.2.1. The results are estimated on per hectare basis, as it is the standard practice followed. The analysis is attempted at district wise as well as classwise .The classwise analysis is done pooling the whole samples. The total cost of cultivation (cost C3) is estimated at Rs.14059 per ha. The class wise, analysis shows that it was higher for class I (Rs.15058.63 per hectare) than class II (Rs.11974.60 per hectare), indicating economy of scale. It was the highest for Malappuram district (Rs.16149.89 per hectare) and lowest for Wayanad district (Rs.11408.65 per hectare).

Table4.2.1. **Inputwise cost of cultivation of njavara (Rs./ha)**

Sl No.	Particulars	District				Class		Average
		Thrissur(n=15)	Palakkad(n=8)	Malappuram(n=11)	Wayanad(n=26)	I (n=41)	II (n=19)	
1	Hired human labour	5844.40 (36.37)	3106.80 (22.69)	5334.60 (33.03)	4386.00 (38.44)	4223.62 (28.05)	4623.36 (38.61)	4586.46 (32.62)
2	Hired machine labour	1466.82 (9.13)	1466.82 (10.71)	1466.82 (9.08)	1325.80 (11.62)	1482.60 (9.85)	1271.20 (10.62)	1413.34 (10.05)
3	Seeds	1895.22 (11.79)	1971.36 (14.40)	1895.76 (11.74)	1797.12 (15.75)	1884.60 (12.52)	1721.16 (14.37)	1860.87 (13.24)
4	Manures	-	-	-	-	-	-	-
5	Fertilizers	-	-	-	-	-	-	-
6	Plant protection chemicals	-	-	-	-	-	-	-
7	Miscellaneous	-	-	-	-	-	-	-
8	Land revenue	125.00 (0.78)	125.00 (0.91)	125.00 (0.77)	125.00 (1.10)	125.00 (0.83)	125.00 (1.04)	125.00 (0.89)
9	Interest on working capital	131.22 (0.82)	93.80 (0.69)	124.06 (0.77)	107.35 (0.94)	108.50 (0.72	108.85 (0.91)	112.30 (0.80)
10	Depreciation	-	-	-	-	-	-	-
	Cost A1	9462.66	6763.78	8946.24	7741.27	7824.32	7849.57	8097.97
11	Rent on leased in land	-	-	-	-	-	-	-
	Cost A2	9462.66	6763.78	8946.24	7741.27	7824.32	7849.57	8097.97
12	Interest on value of own fixed assets	-	-	-	-	-	-	-
	Cost B1	9462.66	6763.78	8946.24	7741.27	7824.3	7849.57	8097.97
13	Rental value of own land	4147.05 (25.80)	5050.60 (36.88)	5130.33 (31.77)	2038.63 (17.87)	4090.28 (27.16)	2466.83 (20.60)	3820.62 (27.17)
	Cost B2	13609.71	11814.38	14076.57	9779.9	11914.5	10316.4	11918.58
14	Imputted value of family labour	1000.70 (6.23)	633.90 (4.63)	605.15 (3.75)	591.60 (5.19)	1775.16 (11.79)	569.60 (4.76)	862.69 (6.14)
	Cost C1(cost B1 +imputed value of family labour)	10463.36	7397.68	9551.39	8332.87	9599.48	8419.17	8960.66
	Cost C2 (cost B2 +imputed value of family labour	14610.41	12448.28	14681.72	10371.50	13689.66	10886	12781.26
15	Imputed value of management input (10% of cost C2)	1461.041 (9.09)	1244.828 (9.09)	1468.172 (9.09)	1037.150 (9.09)	1368.966 (9.09)	1088.60 (9.09)	1278.126 (9.09)
	Cost C3	16071.45	13693.11	16149.89	11408.65	15058.63	11974.60	14059.39
	Rounded of figures	16071	13693	16150	11409	15059	11975	14059

Note : Figures in parentheses denote the percentage of total.

Table4.2.2. **Cost of cultivation under various cost concepts(Rs/ha) .**

Costs	Thrissur	Palakkad	Malappuram	Wayanad	Class I	Class II	Average
Cost A_1	9462.66	6763.78	8946.24	7741.27	7824.32	7849.57	8097.97
Cost A_2	9462.66	6763.78	8946.24	7741.27	7824.32	7849.57	8097.97
Cost B_1	9462.66	6763.78	8946.24	7741.27	7824.32	7849.57	8097.97
Cost B_2	13609.71	11814.38	14076.57	9779.90	11914.5	10316.40	11918.58
Cost C_1	10463.36	7397.68	9551.39	8332.87	9599.48	8419.17	8960.66
Cost C_2	14610.41	12448.28	14681.72	10371.50	13689.66	10886	12781.26
Cost C_3	16071.45	13693.11	16149.89	11408.65	15058.63	11974.60	14059.39

It was estimated to be Rs.16071.45 per hectare and Rs.13693.11 per hectare respectively for Thrissur and Palakkad districts. Average area under the crop is large in Wayanad so labour can be more effectively used for various operations compared to other districts. More over, the wage rate was also comparatively lower.

The Cost C_3 includes all explicit as well as implicit costs and hence is not realistic from the point of view of the farmer. The economic considerations of the farmers are mostly based on Cost A_1 which includes only the directly paid out costs. On an average, CostA_1 is estimated at Rs.8097.97 where it is lowest in Wayanad and highest in Thrissur. Mathew (2001) estimated the total paid out cost of paddy cultivation as Rs.16056/ha in Kuttanad. This difference in the cost of cultivation from that reported by Mathew (2001) is due to non application of inputs like manures, fertilizers and plant protection chemicals for *njavara* crop as well as the special management conditions in Kuttanad. While in Malappuram district the Cost B_2, C_2 and C_3 was at the highest level; Cost C_1 was at the peak in Thrissur.The imputed value of family labour was highest in Thrissur, and the same was lowest in Palakkad. A detailed analysis of various components of the cost will provide more insight into the reasons for variability.

4.2.2.1. ***Seeds***

The source of seeds for majority of the *njavara* cultivating farmers in Wayanad district is through M.S Swaminathan Research Foundation, (MSSRF, Kalpetta). In the other districts it is mainly the farm saved seeds. The informations on different types of *njavara* and seed rate followed in the area and recommended seed rate for paddy (as per Package Of Practices Recommendation for crops by Kerala Agricultural University for short duration varieties) is given in the table 4.2.3.

It was found that, awned black type and awnless golden yellow are the main types grown in Thrissur and Palakkad districts, where as it was awnless black grown in Malappuram and Wayanad districts. Awned golden yellow type was not common in the study area.

Table4.2.3. **Varieties and seed rate used**

	Type of Njavara cultivated	Seed rate (Kg/ha)	
		Adopted	Recommended
Thrissur	Awned Black type and awnless golden yellow type	105.29	80-100
Palakkad	Awned Black type and awnless golden yellow type	109.52	80-100
Malappuram	Awnless Black type	105.32	80-100
Wayanad	Awnless Black type	99.84	80-100
Class I	Awned Black type Awnless Black type Awnless golden yellow type	104.70	80-100
Class II	Awned Black type Awnless Black type Awnless golden yellow type	95.62	80-100

The seed rate in Wayanad was in accordance with Kerala Agricultural University recommendation for short duration local varieties of paddy. In the other places it was at slightly higher level. Similarly the class I category follow a higher seed rate. Elsy et al (1990) suggested a higher seed rate for the crop owing to the poor tillering habit.

On an average the expenditure on seed was 13.24 percentage of total cost of cultivation. The cost incurred on seeds was the lowest in Wayanad (Rs.1797.12 per hectare) and the highest in Palakkad (Rs.1971.36 per hectare) followed by Malappuram (Rs.1895.76 per hectare) and Thrissur (1895.22 per hectare). This is due to the lower seed rate, as the price of the seed is same in all the districts. Mathew (2001) estimated the cost of seeds in paddy cultivation as 3.92 per cent (Rs.918.1 per hectare) of the total cost of cultivation in Kuttanad whereas Mohandas (1994) estimated it as 5.98 per cent of the total cost in Thrissur district. But the cost of njavara seeds is two times that of ordinary rice.

4.2.2.2. ***Labour***

Human labour is reported as the largest single item of expenditure in paddy cultivation in all the studies so far conducted. Total labour used in *njavara* cultivation is estimated to be 72.5 mandays/hectare, with lowest level in Wayanad (67.51 mandays/ha) and the highest in Thrissur district (76.61 mandays/ha). Earlier studies by Mathew (2001) have estimated the labour use in paddy as 101.56 mandays per hectare (Kuttanad). Labour use was higher in lower sized holding and lower in higher sized holding. Therefore economy of scale was evident in labour use. The proportion of hired labour was quite high in all districts, as most of the operations are time bound. As expected the proportion was higher in class I. The involvement of family labour in *njavara* cultivation is highest in Thrissur district. Despite this, owing to a higher wage rate imputed value was also highest in Thrissur.

Generally paddy cultivation is regarded as a labour intensive activity with a higher involvement of female labour force. The average labour contribution by

Table4.2.4. **Total labour use pattern in njavara cultivation (mandays per hectare).**

	Male labour			Female labour			Total		
	Family	Hired	Total	Family	Hired	Total	Family	Hired	Total
Thrissur	2.35 (3.07)	16.18 (21.12)	18.53 (24.19)	9.26 (12.09)	48.82 (63.72)	58.08 (75.81)	11.61 (15.15)	65 (84.85)	76.61 (100.00)
Palakkad	3.57 (4.96)	10.71 (14.87)	14.28 (19.83)	7.74 (10.75)	50 (46.99)	57.74 (80.17)	11.31 (15.70)	60.71 (84.30)	72.02 (100.00)
Malappuram		14.89 (20.08)	14.89 (20.08)	9.31 (12.54)	50 (67.39)	59.31 (79.93)	9.31 (12.55)	64.89 (87.45)	74.2 (100.00)
Wayanad	1.94 (2.88)	13.51 (20.01)	15.45 (22.89)	5.98 (8.85)	46.08 (68.26)	52.06 (77.11)	7.92 (11.73)	59.59 (88.27)	67.51 (100.00)
Class I	7.69 (9.39)	10.68 (13.03)	18.37 (22.42)	14.74 (17.99)	48.83 (59.59)	63.57 (77.58)	22.43 (27.37)	59.51 (72.63)	81.94 (100.00)
Class II	0.13 (0.21)	14.05 (22.43)	14.18 (22.64)	4.32 (6.89)	44.14 (70.47)	48.46 (77.36)	4.45 (7.1)	58.19 (92.90)	62.64 (100.00)
Average	2.61 (3.60)	13.34 (18.40)	15.95 (22.00)	8.56 (11.81)	47.99 (66.19)	56.55 (78.00)	11.17 (15.410	61.32 (84.590	72.50 (100.00)

Note : Figures in parentheses denote the percentage of total.

Table 4.2.5 .**Operationwise labour use pattern(mandays /ha).**

	Land Preparation		Seeds and sowing		Harvesting		Post harvesting		Total		Aggregate
	Male	Female	Male	Female	Male	Female	Male	Female	Male	female	
Thrissur	18.53	-	-	5.88	-	25	-	27.20	18.53	58.08	76.61
Palakkad	14.28	-	-	4.76	-	25	-	27.98	14.28	57.74	72.02
Malappuram	14.89	-	-	5.85	-	25	-	28.46	14.89	59.31	74.20
Wayanad	15.45	-	-	4.49	-	23.46	-	24.11	15.45	52.06	67.51
Class I	18.37	-	-	10.36	-	24.79	-	28.42	18.37	63.57	81.94
Class II	14.18	-	-	2.97	-	22.42	-	23.07	14.18	48.46	62.64
Average	15.95	-	-	5.72	-	24.28	-	26.57	15.95	56.54	72.50

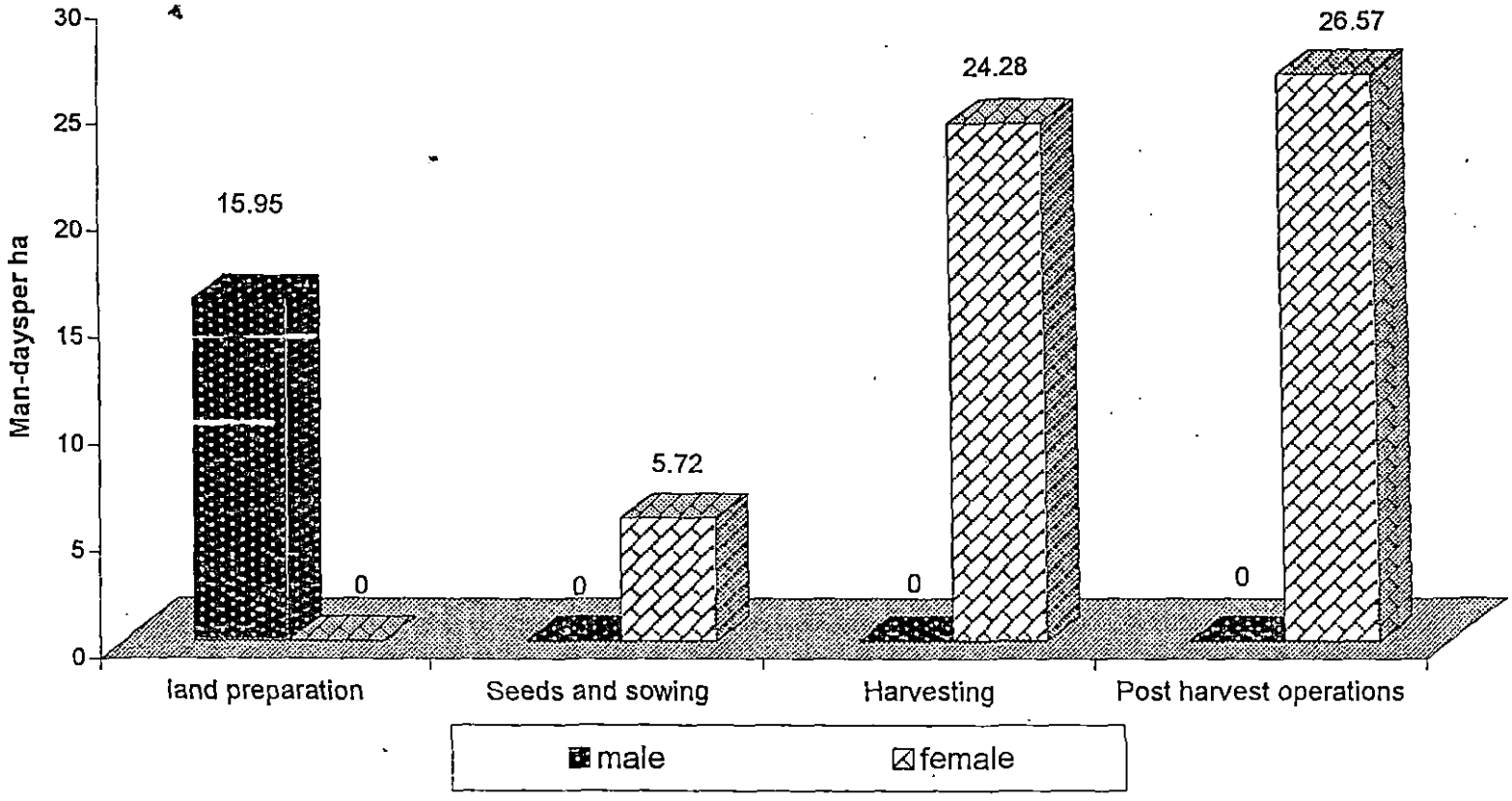

Fig. 2. Operational-wise average labour use pattern

Table4.2.6. **Labour use pattern of rice in Kuttanad**

Operations	Mandays/ha
Land preparation	27.97
Sowing	2.5
Lime application	2.5
Fertilizer application	7.5
Plant protection operation	6.03
Weeding	47.46
Post harvest operations	7.64
Total	101.58

Source: Mathew (2001)

women in the *njavara* cultivation is estimated to be 56.55 mandys i.e. a sizeable proportion of it is hired.

The relative share of male labour to the total labour varied from 18.53 mandays in Thrissur (24.19%) to 14.28 mandays in Palakkad (19.83%). It was estimated to be 15.45 mandays (22.89%) in Wayanad and 14.89 mandays (20.08%) in Malappuram. However in class wise analysis it was 18.37 mandays (22.42%) for class I and 14.18 mandays (22.64%) for class II.

To identify the specific activity, which accounts for the largest share of labour use, operation wise labour use was estimated. It is presented in table 4.2.5. (figure 4). Post harvest operation was the major activity followed by harvesting, land preparation and sowing. Male labour is used only for land preparation while sowing, harvesting and post harvest operations are done by female labour force. The labour use in *njavara* compared to other rice varieties is considerably low owing to difference in agronomic and management practices. While labour related aspects are reported as one of the problem in paddy cultivation, *njavara* can be a promising alternative.

4.2.2.3. ***Manures and agrochemicals***

As already stated *njavara* is mainly utilized for medicinal purpose. The traditional practices include *njavara* being irrigated with cows milk to induce certain desired qualities. So chemical fertilizers, pesticides and manures are not applied to the crop and the crop is desired to be grown in the natural environment. Further the general belief is that *njavara* is resistant to common pests and diseases and that it suppresses weed growth. Recent study by Rakhesh(1999) on economics of paddy cultivation in Kuttanad area has estimated the expenditure on agrochemicals as Rs.3075/ha for farms following conventional rice production practices where as it was Rs.1567/ha for farms following IPM. This can be considered as a cost saving in *njavara* cultivation But the farmers who have recently entered in this enterprise are resorting to the application of agrochemicals. This was observed during the pilot study. However scientific studies as to the effect of agronomic management practices

and medicinal properties are yet to be initiated. In this context the popularization of *njavara* assumes importance.

4.2.3.**Operationwise cost of cultivation**

The major operations in *njavara* production can be grouped as land preparation, seeds and sowing, harvesting and post harvest operations.(Table 4.2.7.) Land preparation accounted for the highest proportion of the total cost in Wayanad (27.87 per cent) and Thrissur (26.42) where as it was only the second important expenditure in Malappuram (21.99 per cent) and Palakkad (19.05 per cent). Mohandas(1994) reported that the cost of land preparation as 13.52 per cent (Rs. 1790.28 per hectare), which formed the third important item of expenditure in Thrissur district.. Mathew (2001) observed the cost of land preparation as 14.79 per cent (Rs. 3464.88 Per hectare) which formed the second important expenditure in Kuttanad. In other rice varieties fertilizer and its application comes out as the important item in total expenditure. Post harvest operations are same as that of other rice varieties. After harvesting, it is winnowed and sun dried (compared to other rice varieties there is marked difference in the case of *njavara* in the payment of harvesting charges .It is paid in cash instead of kind. This is due to the higher price of *njavara*).

The rental value of own land which was imputed as the value of $1/6^{th}$ portion of the produce. It came out as the second important item of expenditure. Rental value was imputed, as it was not common to lease in/lease out land for *njavara* cultivation. It varies from 36.88 per cent (Rs.5050.60 per hectare) to 17.87 per cent (Rs. 2038.63 per hectare) in district-wise analysis and 27.16 per cent (Rs 4090.28. per hectare) to 20.60 per cent (Rs. 2466.83 per hectare) in class-wise analysis. On an average, the expenditure on rental value of ownland was 27.17 per cent of the total operation cost. This is in conformity with the result of Mohandas (1994) who estimated the rental value as 23.70 per cent of the total cost in Kuttanad and Vijaya (1998) who estimated it as 29.24 per cent of the total cost in Pokkali lands of Ernakulam. The percentage of difference between the cost of rental value was due to the yield and cost difference in

Table4.2.7..**Operationwise cost of cultivation of njavara (Rs./ha)**

Sl No.	Particulars	District				Class		average
		Thrissur	Palakkad	Malappuram	Wayanad	I	II	
1	Land preparation	4246.32 (26.42)	2609.22 (19.05)	3551.42 (21.99)	3179.8 (27.87)	3540.04 (23.51)	3286.24 (25.77)	3368.84 (23.96)
2	Seeds and Sowing	2306.82 (14.35)	2185.56 (15.96)	2276.01 (14.09)	2066.52 (18.11)	2526.92 (16.78)	1911.24 (15.96)	2212.19 (15.73)
3	Manure & Manuring	-	-	-	-	-	-	-
4	Fertilizer application	-	-	-	-	-	-	-
5	Plant protection	-	-	-	-	-	-	-
6	Weeding	-	-	-	-	-	-	-
7	Irrigation	-	-	-	-	-	-	-
8	Harvesting	1750.00 (10.89)	1125 (8.22)	1625 (10.06)	1407.60 (12.34)	1536.98 (10.21)	1434.88 (11.98)	1479.91 (10.53)
9	Post harvesting	1904.00 (11.85)	1259.10 (9.20)	1849.90 (11.45)	1446.60 (12.68)	1762.04 (11.70)	1552.96 (12.33)	1662.40 (11.50)
10	Miscellaneous	-	-	-	-	-	-	-
11	Land revenue	125.00 (0.78)	125.00 (0.91)	125.00 (0.77)	125.00 (1.10)	125.00 (0.83)	125.00 (1.04)	125.00 (0.89)
12	Interest on working capital	131.22 (0.82)	93.80 (0.69)	124.06 (0.77)	107.35 (0.94)	108.50 (0.72)	108.85 (0.91)	112.30 (0.80)
13	Depreciation	-	-	-	-	-	-	-
14	Interest on value of own fixed capital	-	-	-	-	-	-	-
15	Rent on leased on land	-	-	-	-	-	-	-
16	Rental value of own land	4147.05 (25.80)	5050.60 (36.88)	5130.33 (31.77)	2038.63 (17.87)	4090.28 (27.16)	2466.83 (20.60)	3820.62 (27.17)
17	Imputed value of management input	1461.041 (9.09)	1244.828 (9.09)	1468.172 (9.09)	1037.15 (9.09)	1368.966 (9.09)	1088.60 (9.09)	1278.126 (9.09)
Total		16071.45	13693.11	16149.89	11408.65	15058.63	11974.60	14059.39
Rounded of figures		16071	13693	16150	11409	15059	11975	14059

Note : Figures in parentheses denote the percentage of total.

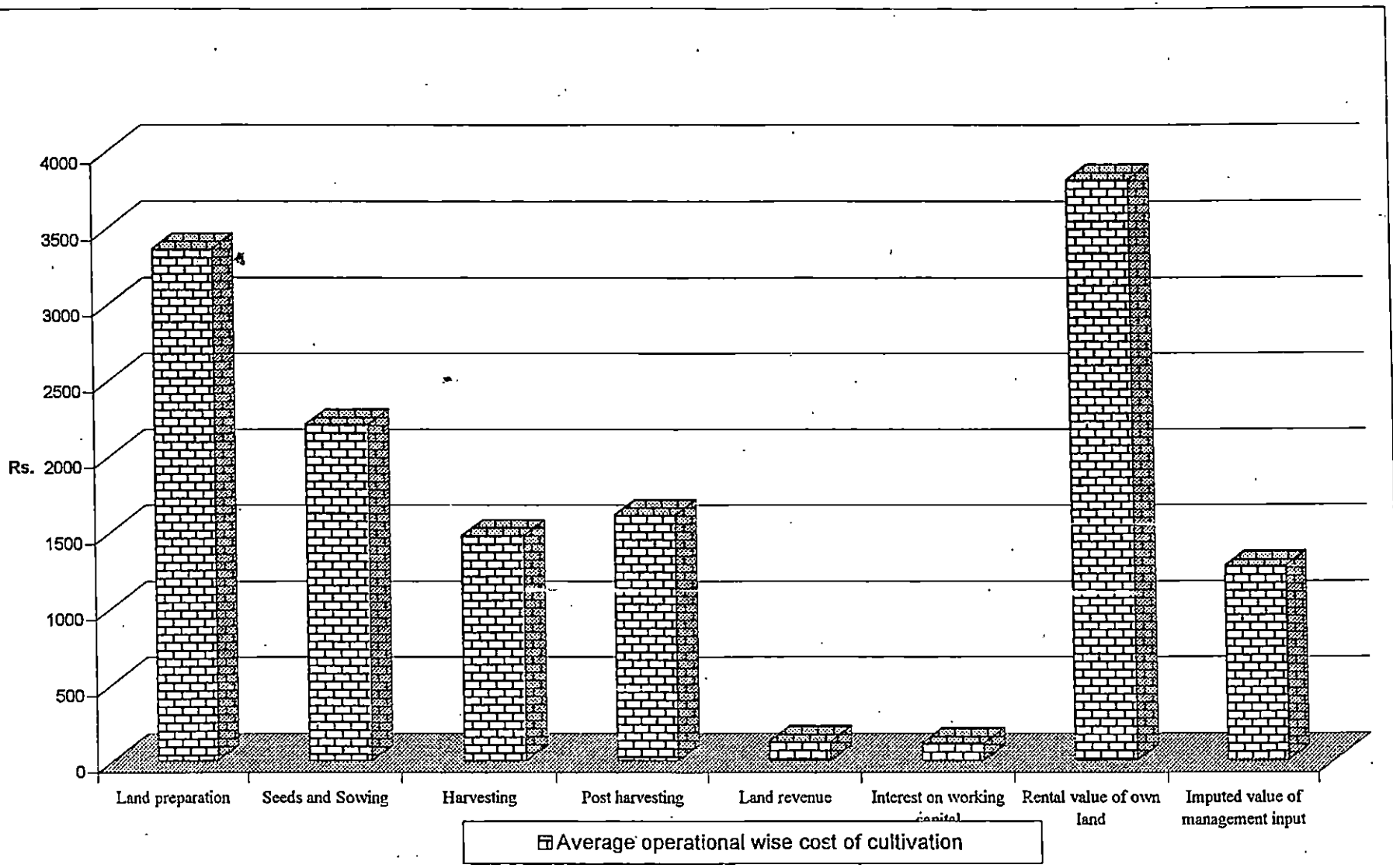

Fig. 3. Average operational wise cost of cultivation

different areas. Relative proportion of the produce was taken as rental value of own land. So when the yield of rice increased the rental value of land also increased.

The third major operation was seeds and sowing which varies from 14.09 per cent (Malappuram) to 18.11 per cent (Wayanad) in districtwise analysis whereas, 15.96 per cent (class II) to 16.78 per cent (class I) in class-wise analysis.

4.2.4. **Yield and returns**

The yield of *njavara* is considerably lower than that of other rice varieties. The average yield for the crop was estimated at 1528.25 kilogram/hectare. The yields in Palakkad and Malappuram districts are higher compared to the other two districts. In Wayanad, it was very low. However the unit price revived by the farmers were the same in all this districts. The straw yield from the crop was on average 4962.05 kilogram/hectare. Comparing with the average yield of rice in these districts the yield of *njavara* was lower by 1639.13 kilogram/hectare, 1678.76 kilogram/hectare,478.87 kilogram/hectare and 3135.55 kilogram/hectare in Thrissur, Palakkad , Malappuram and Wayanad districts. Grain to straw yield ratio of 1:2.5, is higher than that of traditional tall long duration rice varieties. However medicinal properties are not attributed to straw and the price was the same as that of other rice varieties.

Gross income from *njavara* cultivation was highest in Malappuram (Rs. 37723.44 per hectare) followed by Palakkad (Rs. 37180.09 per hectare) and Thrissur (Rs. 31136.42 per hectare), where as, in Wayanad it was the minimum (Rs. 17254.75 per hectare). In class-wise analysis gross income was the highest for class I (Rs. 30092.44 per hectare) and lower for class II (Rs. 20063.55 per hectare). Mathew (2001) reported that the gross income from paddy was Rs. 25252.50 per hectare in Kuttanad. Mohandas (2001) observed gross income from paddy as Rs. 16660.70 per hectare in kole lands of Thrissur district. Compared to that, gross income is higher for *njavara* crop except in Wayanad.

Farm business income is the most relevant income measure from the profit view of the farmer. Farm business income for *njavara* production was the highest in Palakkad (Rs.30416.31), accounting for 81.81 per cent of the gross income. In

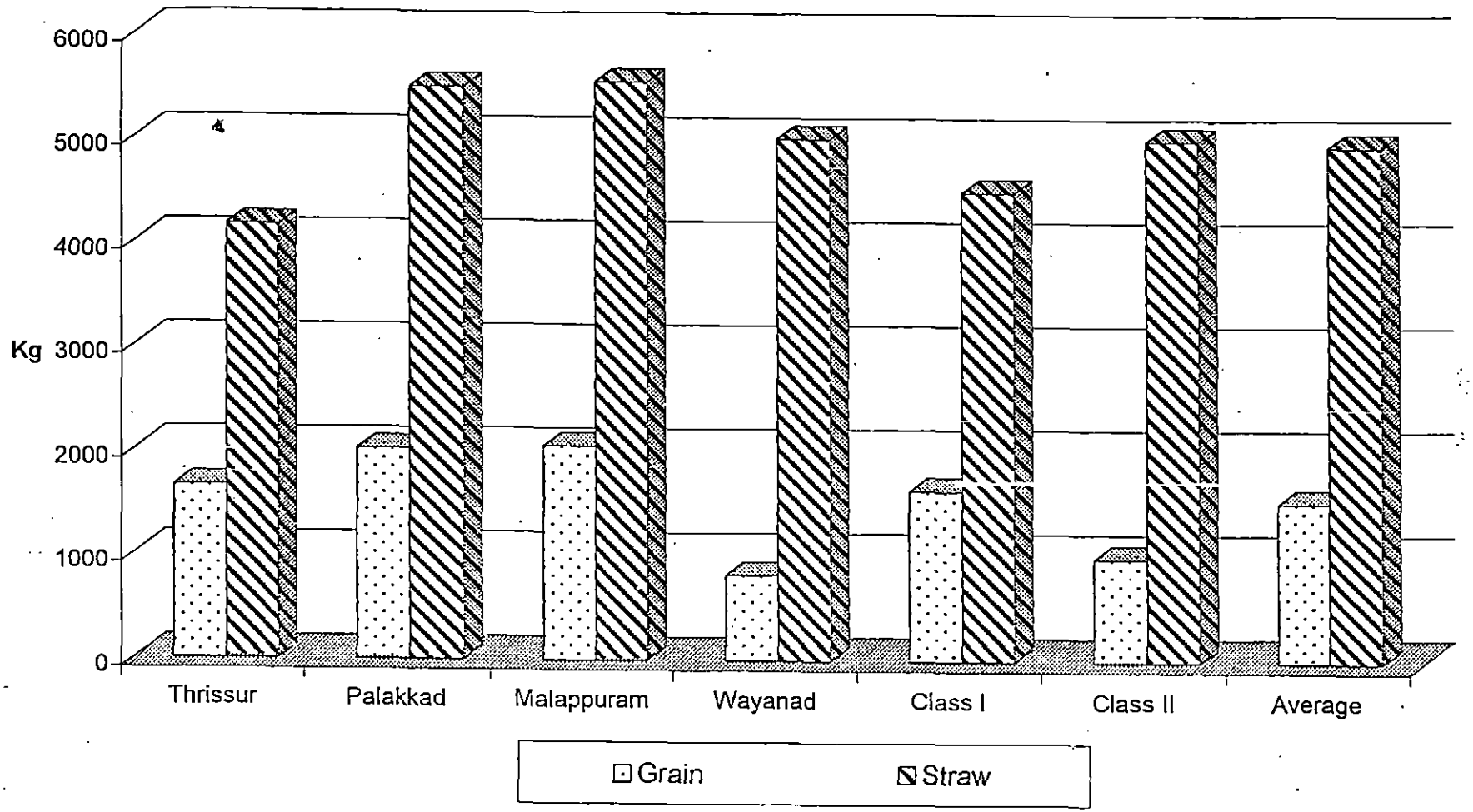

Fig .4. Grain yield and straw yield of njavara (per hectare)

Table4.2.9. **Efficiency estimates in njavara cultivation**

Sl No	Income measures	Thrissur	Palakkad	Malappuram	Wayanad	Class I	Class II	Average
1	Gross Income	31136.42	37180.09	37723.44	17254.75	30092.46	20063.55	28908.45
2	Farm business income	21673.76	30416.31	28777.2	9513.48	22268.14	12213.98	20810.48
3	Own farm business income	21673.76	30416.31	28777.2	9513.48	22268.14	12213.98	20810.48
4	Family labour income	17526.71	25365.71	23646.87	7474.85	18177.96	9747.15	16989.88
5	Net income	15064.97	23486.98	21573.55	5846.10	15033.83	8088.95	14849.06
6	Farm investment income	20673.06	29782.41	28172.05	8921.88	2042.98	11644.38	19947.79
7	BC ratio at cost A_1	3.29	5.50	4.22	2.23	3.84	2.56	3.61
8	Cost A_2	3.29	5.50	4.22	2.23	3.84	2.56	3.61
9	Cost B_1	3.29	5.50	4.22	2.23	3.84	2.56	3.61
10	Cost B_2	2.29	3.15	2.68	1.76	2.53	1.94	2.39
11	Cost C_1	2.98	5.03	3.95	2.07	3.13	2.38	3.26
12	Cost C_2	2.13	2.99	2.57	1.66	2.20	1.84	2.23
13	Cost C_3	1.94	2.72	2.34	1.51	2.00	1.68	2.03

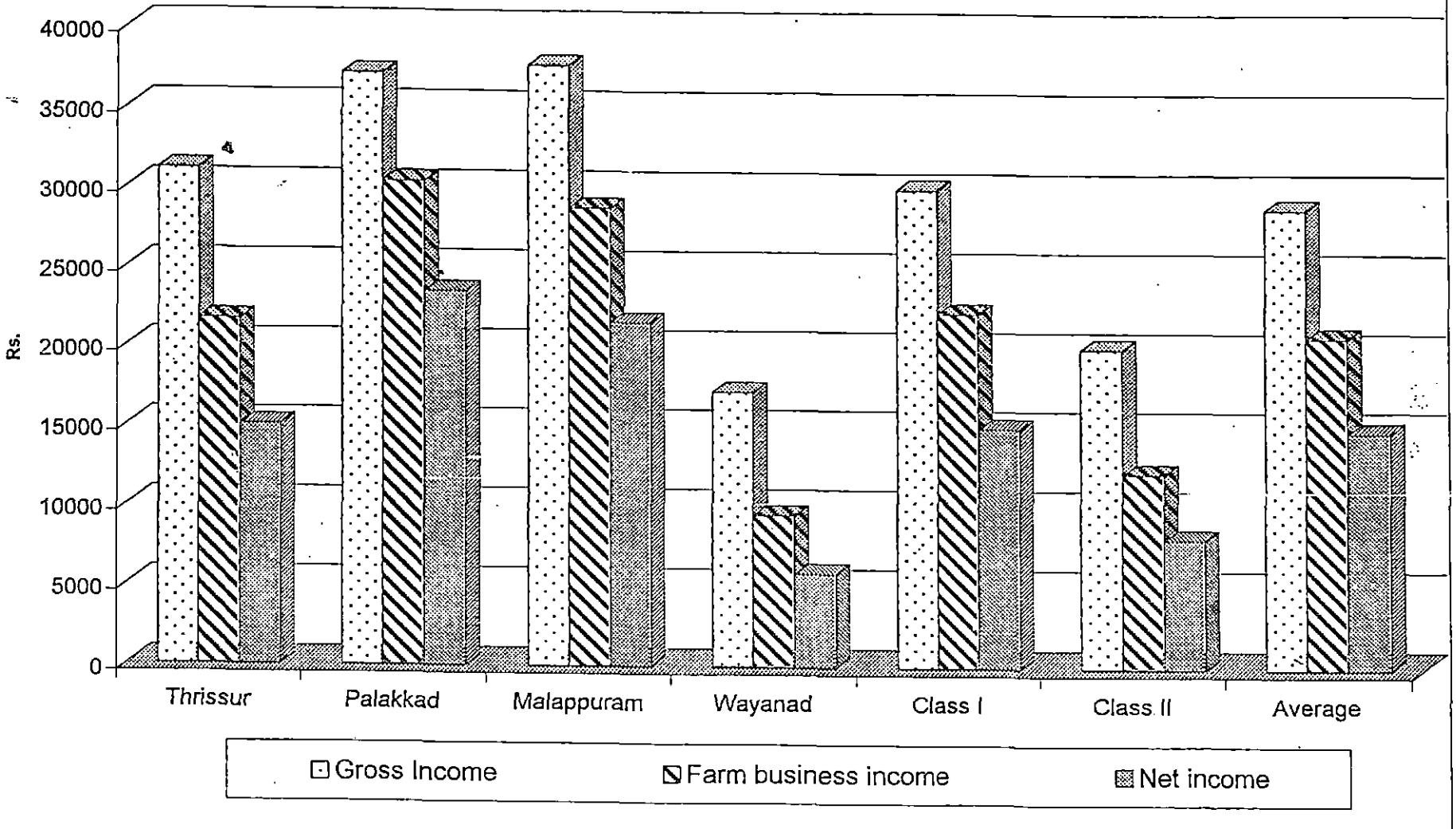

Fig. 5. Income measures

Malappuram, Wayanad and Thrissur it was Rs.28777.20 (76.28 per cent), Rs.9513.48 (55.14 per cent) and Rs.21673.76 (69.61 per cent) respectively. In class wise analysis, it was Rs.22268.14 (74.00 per cent) for class I and Rs.12213.98 (60.88 per cent) for class II. It may be pointed out that despite a lower farm business income in Wayanad the area under the crop is highest in the district. Though gross income is highest in Malappuram all other income measures shows a comparative advantage in Palakkad district. The farmers of Palakkad enjoy a net income of Rs. 23487 per hectare while the average is Rs.14849 per hectare. As usual the larger farmers enjoyed better profit.

The benefit cost ratio of *njavara* grain production computed in relation to various cost concepts is presented in table 4.2.9. In district wise analysis Palakkad and Malappuram occupied the first position with a benefit cost ratio of 2.72 and 2.34 respectively based on Cost C_3 and 5.03 and 3.95 respectively based on Cost C_1. Thrissur and Wayanad were lowered to the third and fourth positions respectively with a benefit cost ratio of 1.94 and 1.51 based on cost C_3. In class wise analysis it varies from 1.68(class I) to 2.03 (class II). B C ratio for ordinary rice is only 1.7.

Benefit cost ratio denotes the value of output per rupee of input cost. It will serve as a measure, which would indicate whether the costs incurred commensurate with the returns obtained. In district wise analysis, the estimated benefit cost ratio was greater than two at all cost concepts in Palakkad (2.72) and Malappuram (2.34). This may be due to less labour related expenses. In Thrissur the benefit-cost ratios based on all cost levels except cost C_3 (1.94) were greater than two. The lowest returns to investment were found in Wayanad (1.51). This projects a paradoxing situation, because the area under the crop is highest in Wayanad.The number of farmers growing *njavara* was found to be lower in Malappuram (11) and Palakkad (7) where there was higher returns per rupee invested. The area under *njavara* cultivation was also lower in these districts (0.94 hectare and 0.84 hectare). The wider acceptability of the crop in Wayanad may be due to the active intervention of MSSRF.

Table4.2.8 **Yield and income from najavara (per hectare)**

Sl. No	Districts\ Class	Grain			Straw			Gross income Rs.
		Quantity (kg)	Rate Rs./kg	Value (Rs.)	Quantity (kg)	Rate Rs./kg	Value (Rs.)	
1	Thrissur	1658.82	15	24882.3 (79.91)	4169.41	1.50	6254.12 (20.09)	31136.42 (100.00)
2	Palakkad	2020.24	15	30303.6 (81.50)	5501.9	1.25	6876.49 (18.50)	37180.09 (100.00)
3	Malappuram	2052.13	15	30781.95 (81.60)	5553.19	1.25	6941.49 (18.40)	37723.44 (100.00)
4	Wayanad	815.45	15	12231.75 (70.89)	5023	1.00	5023 (29.11)	17254.75 (100.00)
5	Class I	1636.11	15	24541.65 (81.55)	4512.82	1.23	5550.77 (18.45)	30092.46 (100.00)
6	Class II	986.73	15	14800.95 (73.77)	5012	1.05	5262.6 (26.23)	20063.55 (100.00)
	Average	1528.25	15	22923.75 (79.24)	4962.05	1.21	6004.08 (20.76)	28927.83 (100.00)

4.2.5. **Cost of production.**

Despite the lowest cost of cultivation, the cost of production was (cost C3) was highest in Wayanad (Rs. 9.92/Kg) and the lowest in Palakkad (Rs. 5.52/kg). It was Rs. 6.42/kg in Malappuram and Rs. 6.62/ Kg in Thrissur. In class-wise analysis it varies from Rs. 7.68/ Kg. (class II) to Rs. 8.95/Kg (class I). The cost of production of *njavara* shows variation among the producing centers on account of the difference in yield and cost structure. However, at cost A_1 level the production cost is lowest in Palakkad and highest in Wayanad, the average being Rs.4.56/kg

4.2.6. **Relative economics**

Area and production of rice in Kerala is succumbing to economic pressure emanating from other remunerative crops like banana and also the pressure from other sectors. This resulted in the decline of more than two lakh hectares of area under paddy during last two decades (Economic Review, 2003). This apart from the effect on food economy, has ecological effects as well.Comparing to traditional rice varities, *njavara* stands a better position with respect to the economics. However, it may be remembered that it cannot be substituted for traditional rice varieties as a food crop and in all pockets.

Table 4.2.11.**Relative economics**

	Traditional area	Net income(Rs./ha)	BC ratio
Mohandas(1994)	Kole	1054.56	1.07
	Kuttanad	2450.82	1.1
Rakesh(1999)	Kuttanad	13430(IPM)	2.01(IPM)
		11295(non IPM)	1.77 (non IPM)
Vijesh(2001)	Kuttanad	-4020.08	0.87
	Pokkali	-5955.68	0.64
Mathew(2001)	Kuttanad	1833.03	1.08
Njavara		15064.97	2.03

Table.4.2.10. **Cost of production of njavara (Rs/kg)**

Costs	Thrissur	Palakkad	Malappuram	Wayanad	Class I	Class II	Average
Cost A_1	4.56 (456)	2.73 (273)	3.56 (356)	6.73 (673)	3.91 (391)	5.87 (587)	4.56 (456)
Cost A_2	4.56 (456)	2.73 (273)	3.56 (356)	6.73 (673)	3.91 (391)	5.37 (537)	4.56 (456)
Cost B_1	4.56 (456)	2.73 (273)	3.56 (356)	6.73 (673)	3.91 (391)	5.37 (537)	4.56 (456)
Cost B_2	6.56 (656)	4.77 (477)	5.60 (560)	8.50 (850)	5.94 (594)	7.71 (771)	6.51 (651)
Cost C_1	5.04 (504)	2.98 (298)	3.80 (380)	7.24 (724)	4.78 (478)	6.29 (629)	5.02 (502)
Cost C_2	7.04 (704)	5.02 (502)	5.84 (584)	9.02 (902)	6.82 (682)	8.14 (814)	6.98 (698)
Cost C_3	7.74 (774)	5.52 (522)	6.42 (642)	9.92 (992)	7.51 (751)	8.95 (895)	7.68 (768)

(Figures in parenthesis denote Rs./Qtl)

.4.2.7. Value addition

The higher market price for *njavara* is an indication of its medicinal value, which gets further multiplied by the use in ayurvedic industry. Farm level processing and value addition is not practiced now, and hence farmers are denied of the share. The standardization of processing to suit the requirements of user industry is of prime importance in this regard.

4.3.MARKETING

4.3.1. Marketing of njavara

Njavara is not usually grown as a food crop and is generally intended for sale for medicinal use. Hence the volume of the produce retained for home consumption is rather low. There are instances of *njavara* being used for domestic consumption, but it is only to a limited extent. The higher market price also promotes the farmer to sell the maximum quantity of the product. The main purpose of retention in this is for seed.

The term marketed surplus of an agricultural produce represent that part of a year's produce which the farmer disposes of. It is very important to examine the pattern of marketed surplus of agricultural produce and the factors, which determine its extent and flow. Marketed surplus depends not only on production but also on the farmer's behavior regarding retention for various needs like retention for home consumption, seed requirement and payment of wage in kind. There was no kind payment system in *njavara* and the payments of hired labourers were settled fully in cash. So farm retention constituted only a small portion retained for household use and for seed purpose.

Analyses of marketed surplus of njavara are presented in table 4.2.12. It was observed that 90.33 percentage of the total produce formed the marketed surplus leaving a negligible proportion as farm retention. Marketed surplus was 86.07 per cent for class I where as it was 90.82 per cent for class II. Class wise analysis showed that marketed surplus increased as the size of holding increased.

4.3.2. Marketing channel.

*Table4.2.12.***Marketable surplus and farm retention**

District	Production (kg/ha)	Marketable surplus(kg/ha)	Farm retention(kg/ha)
Thrissur	1658.82 (100.00)	1465.24 (88.33)	193.58 (21.67)
Palakkad	2020.24 (100.00)	1881.05 (93.11)	139.19 (6.89)
Malappuram	2052.13 (100.00)	1925.51 (93.83)	126.62 (6.17)
Wayanad	815.45 (100.00)	706.83 (86.68)	108.62 (13.32)
Class I	1636.11 (100.00)	1408.20 (86.07)	227.94 (13.93)
Class II	986.73 (100.00)	896.15 (90.82)	90.58 (9.18)
average	1528.25 (100.00)	1024.90 (89.23)	147.75 (10.77)

Note : Figures in parentheses denote the percentage of total.

Table 4.2.13.Distribution of respondents according to type of buyers: -

Product sold to	Thrissur	Palakkad	Malappuram	Wayanad	Total
Ayurvedic drug manufacturing unit	3 (20.02)	4 (50.00)	6 (54.55)	4 (15.38)	17 (28.34)
Retail shop dealer	2 (13.33)	3 (37.50)	3 (27.27)	6 (23.10)	14 (23.33)
Ayurvedic doctor	2 (13.33)	1 (12.50)	1 (9.09)	4 (15.38)	8 (13.33)
Traditional vaidyas	2 (13.33)	-	1 (9.09)	4 (15.38)	7 (11.64)
Dealer	2 (13.33)	-	-	4 (15.38)	6 (10.00)
Trader	4 (26.66)	-	-	4 (15.38)	8 (13.33)
Total	15 (100)	8 (100)	11 (100)	26 (100)	60 (100)

Note : Figures in parentheses denote the percentage of total.

The marketing channels are the routes through which the product moves from the primary producer to the end users. The following marketing channels were identified in the marketing of njavara in the study area.

1. Producer → Ayurvedic drug manufacturing units
2. Producer → Retailers → Ayurvedic drug manufacturing units/Ayurvedic physicians \ Vaidyas
3. Producer → Ayurvedic physicians
4. Producer → traditional Vaidyas
5. Producer → Wholesale dealers → Ayurvedic drug manufacturing units
6. Producer → Commission agents → Wholesale dealers→dealers of outside Kerala.

The most widely adopted channel is producer →Ayurvedic drug manufacturing unit (around 28 per cent).

The distribution of farmer respondents according to the type of buyers (table 4.2.13.) showed that, of the total sample of 60 farmers 28 per cent sold their produce directly to the Ayurvedic drug manufacturing units, while 23.3 per cent sold directly to retailers. It was 13.33 per cent, 11.64 per cent, 10 per cent and 13.33 per cent respectively for Ayurvedic doctors, traditional Vaidyas, Wholesale dealers and commission agents. Contrary to this in other medicinal plants where there is a oligopolistic situation (few traders), there is a direct transaction between the producer and user industry which reduces the length of marketing channel. This ensures a fairer share of consumers rupee to the producer

4.4. INDIGENOUS TECHNICAL KNOWLEDGE

Reijntes et al (1992) defined indigenous knowledge as the knowledge of the people living in a certain area, generated by their own and their ancestor's experience and knowledge originated from elsewhere which has internalized by the local people. The Indigenous Technical Knowledge of a farming population living in a specific area is derived from the local people's past farming experience. It is passed from one

generation to another by word of mouth. Unless conscious efforts are made to collect and document them, valuable information may be lost. The central point is that farmer's knowledge is the product of centuries of trail and error. This knowledge provides a basis for identifying ecologically sustainable options of research use, which is finely tuned, both biologically and socially. The Indigenous Technical Knowledge associated with the cultivation and use of *njavara* are listed below

Table 4.2.14.Indigenous Technical Knowledge.

No.	Indigenous Technical Knowledge	Percentage of farmers reported
1	*Njavara* is widely used in Ayurvedic system of medicine for Panchakarma treatment involving baths and massages for curing paralytic conditions.	90
2	*Njavara* is widely used in Ayurvedic system of medicine for Panchakarma treatment involving baths and massages for curing paralytic conditions.	5
3	It is used as a starter solid food for infants and as a food grain for the invalids. '*Ankri*' a special preparation using *njavara* and Kannan variety of Banana is used for this.	7
4	Roots of *njavara* are used for curing urinary complaints and to control blood sugar level	3
5	'*Shastika thilakam*' a preparation from the bran of *Njavara* is used to give glowing colour and brightness to the skin.	3
6	*Njavara* is also used as a nervous stimulant	9

7	*Njavara* is usually consumed as raw rice. If it is consumed in parboiled form, copper vessels should be used for parboiling.	30
8	In the Malayalam month ' Karkidakam' *Njavara* Kanji is used to increase the immunity of our body	92
9	In burnt portion of the body *Njavara* rice is pasted to cure it.	15
10	Water stagnation is not allowed in *Njavara* fields, as it will increase the lodging character.	54
11	Weeding is not required in *Njavara.* As *Njavara* is a tall, fast growing and short duration crop, it can resist the weed growth	72
12	Early harvesting is done in *Njavara* to reduce shattering of grains.	63
13	Seeds are treated with cow dung. As a prophylactic measure farmers soak seed in cow dung water. It will also act as a booster dose for the seeds (generally in rice cultivation).	55
14	Placing soaked seeds in bamboo baskets lined with arrow root, Banana and teak leaves. The heat produced as a result of compaction hastens the germination process. Arrow root leaves were found very effective in storing the pre-germinated seeds.	35
15	*Njavara* rice is a main ingredient of medicinal preparations used for curing ailments like polio infection, ulcer, piles, dysentery and anemia.	10

16	*Njavara* grown in uplands have more quality and medicinal value compared to those cultivating in low lands So *njavara* usually cultivating in uplands. Crops with duration of 60 days have more medicinal value.	68
17	In Northern districts of Kerala it is generally believed that awnless black type njavara has the greatest medicinal value than other types. But in Palakkad and Thrissur the belief is that awned black type is the best one.	33
18	Medicinal properties of *njavara* increase when it is stored for a long time.	80
19	Seeds for *njavara* cultivation should not be stored for more than six months.	70
20	Victims of snake bite can take *njavara* rice as a safe food	8
21	Cooked *njavara* rice and drumstick leaves together used in a paste form for curing cough.	15
22	Farmers believe that Tuesday and Friday are not good for sting the crop.	80

The Indigenous Technical Knowledge cited above where the community knowledge of the farming communities belonging to Thrissur, Palakkad, Malappuram and Wayanad districts.

Njavara got wider use because of its medicinal properties as listed above. But they are known only to selected few. Hence there is a pressing need for systematic documentation of the Indigenous Technical Knowledge associated with its cultivation and use.

Our country needs a concurrent action to recognize and reward the conservors of biodiversity and holders of the Indigenous Technical Knowledge for their invaluable contribution. The Biological Diversity Bill 2002 passed by the Lok Sabha (2002) takes care of the rights of holders of biological material and indigenous knowledge. Clause 21 of the bill states that " The national biodiversity authority shall granting approvals under section 19 or section 20 ensure that the terms and conditions subject to which approval is granted secures equitable sharing of benefits arising out of the use of accessed biological resources, their by-product innovations an practices associated with their use and applications and knowledge relating there to in accordance with mutually agreed terms and conditions between the person applying for such approval, local bodies concerned and the benefit claimers ". Thus the efforts taken for the conservation of biological materials and traditional knowledge will be rewarding to its holders and to the whole mankind.

Policy implications

1) *Njavara* is proved to be economically more attractive than conventional rice varieties. It can be popularized in feasible areas where paddy was substituted by other crops on economy grounds.

2) Since it is used mainly as a medicinal crop, the marketing can be ensured only through realistic demand estimation of the user industries. Studies should be initiated in these lines to effect production planning for the crop.

3) Alternate uses of *njavara* in farm households may be popularized.

4) In areas like upland fields were water availability is less for growing other rice varieties *njavara* should be recommended, as it requires only less water compared to other rice.

5) Detailed studies to identify the medicinal and nutritive principles in *njavara* grain have to be carried out.

6) Standardization of management practices for the crop is to be attempted in the view of the use as medicinal crop.

Summary

5. SUMMARY

The present study on the economics of commercial production and utilization of medicinal rice, *njavara* was conducted in Thrissur, Palakkad, Malappuram and Wayanad districts, with the objectives of assessing the economics of production and marketing prospects of *njavara* and documenting the Indigenous Technical Knowledge (ITK) associated with its cultivation and use.

The required information was collected from a sample of 60 *njavara* farmers from the above four districts by personal interview method using well structured, pre-tested questionnaire. The marketing aspects were studied by contacting producers, market intermediaries and end users, by personal interview method. The Indigenous Technical Knowledge were gathered from the producers, traditional vaidyas, ayurvedic medical practitioners and elderly people in the locality.

The cost of cultivation of *njavara* (Cost C_3) was estimated as Rs.14059/hectare.The district wise analysis revealed that it was the highest for Malappuram and lowest for Palakkad, whereas in class wise analysis it was higher for class I than class II.

Seeds accounted for nearly 11.74 per cent to 15.75 per cent of total expenditure. The cost incurred on seeds was Rs.1860.87/hectare. Human labour was the highest single item of expenditure constituting about 22.69 per cent to 38.44 per cent. The average labour use was 72.50 man days /hectare .As in the case of other paddy varieties female labour constituted a major share of total labour use. On an average, it was 56.55 man days/hectare during a crop cycle. Female laborers carry out all major activities except land preparation. Post harvest operations demand the highest labour use. But operationwise estimation of total cost of cultivation has shown land preparation as the most expensive activity, as the wage rate for men are higher than that of the women. Nearly one fourth of the total cost was for this. It remained as the most important item of expenditure.

Average yield from *njavara* crop was found to be much less than other rice varieties (1528.25 kg/hectare). It is only 70 percentage of the average yield of rice in the state. The yield in Palakkad and Malappuram districts were higher than the other two. Large farms enjoyed better yield The grain to straw yield was in the ratio of 1:2.5.

The Gross income from the crop was found to be Rs.28928/ha. Farm business income, the most relevant from the farmer's point of view was more in Palakkad district (Rs.30416/hectare) compared to other districts. The same applies to all other income estimates. The farmers of Palakkad enjoy a net income of Rs.23487/hectare while the average was Rs. 14849/hectare. The cost of production was Rs.7.68/kg . Despite the lowest cost of cultivation, the cost of production was (at Cost C_3) highest in Wayanad (Rs.9.92/kg). The average benefit cost ratio based on cost C3was 2.03.It was the highest for Palakkad (2.72).

The marketable surplus accounted for 90.33 per cent (1380.50 kg/hectare) of the total produce and the farm retention was only 9.67 per cent (147.75 kg /hectare) . In district wise analysis the marketable surplus varied from 86.68 per cent to 93.83 per cent between the districts But between classes it varied from 86.07 per cent to 90.82 per cent, which revealed that marketable surplus increased with the increase in the size of holding.

In the study area, six major marketing channels were identified. Among this the most widely adopted channel was 'producer→ ayurvedic drug manufacturing unit' (around 28 per cent).

The Indigenous Technical Knowledge associated with the cultivation and use of the crop is compiled and listed.

The recommendations for policy formulations based on the study is also sugested

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Appendices

INTERVIEW SCHEDULE FOR DATA COLLECTION FOR THE THESIS ENTITLED ECONOMICS OF COMMERCIAL PRODUCTION AND UTILIZATION OF MEDICINAL RICE (*Oryza sativa* L.) NJAVARA.

1. Name and address of the farmer :

Village :
Panchayath :
Block :
Taluk :
District :

2. Family details

Name of the Member	Sex	Age	Relationship with head	Education	Occupation		Income	
					Primary	Secondary	Monthly	Annually

3. Holding size

Particulars	Wet land			Garden land	Total
	I	II	III		
Total area cultivated					
Land put to non agricultural uses					
Fallow land					
Area leased in					
Area leased out					
Gross cropped area					
Area sown more than once					
Net area sown					

4. Cropping pattern

A. Perennials

Crop	HYV/local	Type			Total
		Bearing	Non-bearing	Senile	

B.Annuals

Crop	Area	Season			Total
Njavara					

5. Agricultural Machinery and implements

Implements	Number	Year of purchase	Purchase Value	Present value
Spade				
Tractor				
Plough				
Power tiller				
Pump sets				
Sprayer				
Harvester				
Thresher				
Others				

6. Taxes

a. Land revenue :
b. Water tax :
c. Panchayat tax :
d. Income tax :
e. Others (Specify) :

7. Cost of Cultivation of Njavara

A. Ploughing

	Bullock pair		Total hours	Rate	Tractor/tiller	Total hours	Rate
	Owned	Hired					
1							
2							
3							
4							
5							
Leveling							

B. Construction of Bunds and Channels

	Family		Hired		Rate	
	Men	Women	Men	Women	Men	Women
Labour						

C. Soil amendments applied.

Sl.No	Amendment	Quantity	Value	Reason for application	Remarks

Transportation and application charges

Transportation cost	Family		Hired		Rate		Remarks
	Men	Women	Men	Women	Men	Women	

D. Seeds and Sowing

Source :
Quantity of seeds :
Seed rate :
Total Value :

	Hours of work				Rate	
	Family		Hired			
	Men	Women	Men	Women	Men	Women
Seed preparation						
Soaking the seed						
Transporting						
Sowing						

E. Manures and Fertilizers

Manure	Quantity	Value
FYM		
Green Leaf Manure		
Others (Specify)		

Transportation and application charges

Transportation cost	Family		Hired		Rate	
	Men	Women	Men	Women	Men	Women

Fertilizer	Quantity	Value

Transportation and application charges

Transportation cost	Family		Hired		Rate	
	Men	Women	Men	Women	Men	Women

F. Plant protection

Chemical	Quantity	Time of application	Value

Transportation and application charges

Transportation cost	Application cost	
	Mode of payment	Total amount paid

H. Irrigation.

Irrigating hours /day :
No. of days / week :
No. of weeks /month :
No. of Months/year :
Source :
Method of Irrigation :
Fuel cost / hour :

Items	Family		Hired		Rate	
	Men	women	Men	women	Men	women
Labour charge						

I. Harvesting cost

Labours

Family		Hired		Rate	
Men	Women	Men	Women	Men	Women

J. Post harvest handling:

Particulars	Family		Hired		Rate		Total
	Men	Women	Men	Women	Men	Women	
Transportation cost							
Winnowing							
Sun drying							

If winnowing machine is hired

No. of hours	Rate/hour	Total rent	Fuel charge	Total

Labour charge in cash :
Labour charge in kind :
Rate :
Total value :

8. Receipts:

Area	Quantity		Value	
	Paddy	Straw	Paddy	Straw

9. Utilization of paddy

1. Home consumption :
2. Quantity sold :
   Price :
   Total value :

10. Borrowings for paddy cultivation

Sl.No	Source	Amount	Rate of interest	Repayment terms	Repayment position	Remarks

11. The traditional uses to which Njavara is put to

12. Medicinal properties known.

13. Experience in Njavara cultivation (years)

14. Other relevant information.

Marketing

Method of sale :
Type of the Buyer :
Quantity marketed :
Selling price :
Total value :

Cost incurred in marketing
a. Preparation for market :
b. Loading and unloading :
c. Transport charges :
Mode of transport :
Distance from the market :
Transport/trip :
Total charges :

Cost incurred by the farmer at the market
a. Commission :
b. Brokerage :
c. Stall fee :
d. Gate fee :

Subsidies obtained:

Fertilizers :
Pesticides :
Dewatering :

ECONOMICS OF COMMERCIAL PRODUCTION AND UTILISATION OF MEDICINAL RICE (*Oryza sativa* L.) NJAVARA

By

JAYAKUMAR. V.

ABSTRACT OF THE THESIS

Submitted in partial fulfilment of the requirement for the degree of

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ABSTRACT

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The required information was collected from a sample of 60 *njavara* farmers from the above four districts by personal interview method using well structured, pre-tested questionnaire. The marketing aspects were studied by contacting producers, market intermediaries and end users, by personal interview method. The Indigenous Technical Knowledge were gathered from the producers, traditional vaidyas, ayurvedic medical practitioners and elderly people in the locality. The data collection was conducted during April- July 2003

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The cost incurred on seeds was Rs.1860.87/hectare. Human labour was the highest single item of expenditure. The average labour use per hectare of *njavara* cultivation was 72.50 man days/hectare. Female labour constituted a major share of total labour use. On an average it was 56.55 days/hectare during a crop cycle. Except land preparation all major activities are carried out by wemen. Post harvest operations demand the highest labour use. But, land preparation is the most expensive activity, as the wage rate for men was higher than that of the women. Nearly one fourth of the total cost was for this.

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The marketable surplus accounted for 90.33 per cent (1380.50 kg/hectare) of the total produce and it increased with the increase in the size of holding.

In the study area six major marketing channels were identified. Among this the most widely adopted channel was ' producer→ ayurvedic drug manufacturing unit (around 28 per cent).

The Indigenous Technical Knowledge associated with the cultivation and use of the crop is compiled and listed.