

Value Addition to Paddy as Processed Rice for Enhanced Revenue Generation

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Rice is the primary food for half of world's population providing more than one fifth of calories consumed worldwide. It is grown in at least 114 countries with global production of 645 million tons and Asian farmers contributing about 90% of this total produce. It contains appreciable quantities of nutrients like protein, fat, dietary fiber and certain mineral. Rice has influenced the culture, diets and economics of millions of people worldwide. For more than half of humanity "rice is life" and due to its importance, the United Nations declared 2004 as the "International year of Rice".

The domestication of Asian rice (*Oryza sativa L*) variety by humans started around 10,000 years ago resulting in a series of rice culture developments over the millennia and making it the most important food crop for more than half of world's population. The term 'rice' may be derived from the Tamil word 'arisi'.

The inseparable link of agriculture with climatic variables, impact of climate change on agriculture and food security has been at the forefront of research and policy agenda in recent times as climate change will have an economic impact on agriculture including changes in farm profitability, prices, supply, demand, trade and regional comparative advantages. Rice is already growing in areas where temperature has reached optimal for its growth and any additional increase in day or night temperature or exposure to high temperature during sensitive stages can affect the rice yields. It is estimated that the increasing temperature can potentially introduce greater sensitivity to previously unaffected developmental stages like panicle initiation, spikelet differentiation, gametogenesis and flowering stage.

The high temperature at rice flowering stage can result in failed pollination thereby increasing sterility resulting in significant decrease in seed number and grain yield. The high temperature stress during grain filling stage reduces the assimilate supply from shoot to grain, shortens grain filling duration and ultimately affects the grain yield. Also, there can be reduced utilization of additional non-structural carbohydrates in the sink despite increased assimilate supply from leaves with reduction in starch metabolism due to decreased enzymatic activity.

As rice is one of the most produced and consumed cereals in the world, it has an important role in the relation between the diet and health. The brown rice consists of soluble total phenols between 38 to 60%. The phenolic compounds are mainly present in the pericarp of rice and milling reduces the concentration of them in the grain. The concentration of total phenolics in the grain has been positively associated with the antioxidant activity and reduction of oxidative stress.

Nutritionally brown rice was found to be superior than white rice due to higher content of dietary fiber and micronutrients required by the body in the outer layers that otherwise removed by polishing. The increase in fiber content helps in combating the life style diseases.

Although a lot has been said about the health benefits of brown rice in our diets from ages together, the revenue generated associated with selling brown rice to white rice (Figure 1) to paddy as such are quite interesting.



Figure 1: Types of primary processed rice

(Suneetha *et al.*, 2020)

In Khammam district, rice is grown extensively due to conducive climate conditions

and abundant water availability. But still selling paddy as such is not fetching farmers much. In this context, few progressive farmers have taken up selling of brown to light brown rice for their health benefits as well as additional income generation. Table 1 shows the edible and byproducts generated from 75 Kg paddy bag as white rice, light brown rice and brown rice.

Table 1: Generation of edible and byproducts from paddy for one 75 Kg bag

Products in Kgs	Paddy	White rice	Light brown rice	Brown rice
Quantity	75.0	45 – 47	49 – 51	53 – 54
Brokens	–	5 – 6	3 – 4	2 – 2½
Bran	–	4 – 5	2 – 2½	0 – 1

(Suneetha, *et al.*, 2020)

In a similar manner, the income generated by selling of these edible and byproducts from paddy are shown in Table 2.

Table 2: Income generation from processed rice and byproducts for one 75Kg bag

Cost of produce in Rs.	Paddy	White rice	Semi polished rice	Brown rice
Rice	1300 – 1400	2070 – 2256	2842 – 3060	3445 – 3510
Brokens	–	75 – 90	45 – 60	30 – 40
Bran	–	80 – 96	48 – 64	0 – 16
Total amount	1300 – 1400	2225– 2442	2935 – 3184	3475 – 3556

Brokens per Kg @ Rs. 15

Bran per Kg @ Rs. 16 on an average

The amount of rice generated increased as the polishings decreased with reduced amount of brokens and bran as shown in Table 1. Each 75 Kg bag gives white rice of 45 – 47 Kg, light polished rice of 49 – 51 Kg and brown rice of 53 – 54 Kg after storage for 6 – 12 months. The amount of brokens decreased from 5 – 6 Kg for white rice to 3 – 4 Kg for light brown rice and to 2 – 2½ Kg for brown rice whereas for bran the reduction was from 4 – 5

Kg for white rice to 2 – 2½Kg for light brown rice and to 0 – 1 Kg for brown rice. The whiter the rice the less the content of outer layers rich in phenolic and antioxidant components.

The same cost economics shown in Table 2 when interpreted for one acre when in a farmer gets a yield of 38 – 40 bags and cost of cultivation between Rs 20000 to 25000, the income generated from processing as white rice, light brown rice and brown rice along with byproducts are as given in Table 3.

Table 3: Income generation from processed rice and byproducts for 1 acre land

Cost of produce in Rs.	Paddy	White rice	Light brown rice	Brown rice
Rice	28700 – 30700	59300 – 64300	90500 – 95050	110622 – 115622
Brokens	–	2850 – 3600	1710 – 2400	1140 – 1500
Bran	–	3040 – 3840	1216 – 1600	0 – 640
Total amount	28700 – 30700	65190 – 68500	93426 – 99500	111762 – 117762

The increase in revenue due to simple processing of paddy is shown in Figure 1. The processing and selling as white, light brown and brown rice increased the income by 55.6, 69.2 and 74.1% respectively.

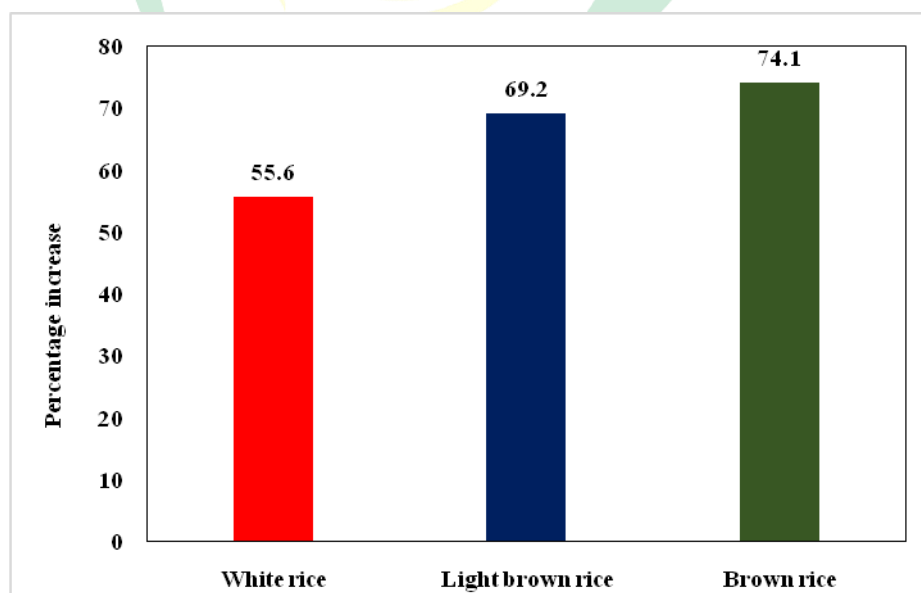


Figure 1: Percentage increase in revenue from processing of paddy



In conclusion, although the farmer can earn money by selling the processed rice, the main hindrance can be storage of paddy for 6 – 12 months before processing as majority are small and marginal farmers in India who cannot afford to store grain safely for that duration of time. Also, many others are landless farmers who lease the land and have to pay to the owners once crop is harvest.

References:

Suneetha, W. J., Kumar, J. H., Rao, P. J. M., and Prasad, Y. G. (2020). Enhancing farmer income through value addition to rice in Khammam District, India. *International Journal of Environment and Climate Change*. **10(9)**: 1-7.

