

COMPARISON OF TOTAL COST OF PRODUCTION AND TOTAL REVENUE BETWEEN DROUGHT TOLERANT AND OTHER CULTIVATED RICE VARIETIES IN TANAHUN, NEPAL

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DOI: 10.46609/IJSSER.2020.v05i08.011 URL: <https://doi.org/10.46609/IJSSER.2020.v05i08.011>

ABSTRACT

Rice production is greatly influenced by drought that results low and varied productivity of rice. Considering the importance of rice production in the national economy, this study aims to assess situation, socio-economics, and productivity of different rice varieties in Tanahun district. Randomly selected 40 paddy growing farmers from different locations were the primary informants. Data was collected in semi structured questionnaire through interview in local language and was analyzed using MS Excel and SPSS. The B:C ratio observed from the study was 1.157, 1.236, 1.109, 1.125, 1.162, 0.974, 1.249 and 1.074 for sukhkha2, sukhkha3, sukhkha4, sukhkha5, sukhkha6, local varieties, other improved and hybrid varieties respectively. The total cost of production in NRs per hectare was 179340, 179900, 188040, 203200, 169050, 185728, 185720 and 205280 respectively. Similarly the productivity in ton/ha was 4.21, 4.53, 4.15, 4.75, 3.75, 3.68, 4.73 and 4.55 respectively for each variety. Maximum revenue was obtained from sukhkha5. This study concludes that those drought tolerant rice varieties especially sukhkha5 (when sown in rainfed upland area) gives better results than hybrid and other improved varieties in terms of productivity and total revenue but, other improved varieties and sukhkha3 are more economic when B:C ratio is considered. This research strongly recommends providing specific cultivation guidelines and labor efficient methods for cultivation of Sukhkha3 and Sukhkha5 to farmers through extension demonstration and awareness creation. Further identification and mapping of other drought-prone domains for further dissemination ensures the drought security in the country.

Keywords: Drought tolerant, Productivity, B: C Ratio, Food insecurity, Mapping

1. INTRODUCTION

1.1 Background

As rice is the most staple food of Asia, More than 90% of the rice is produced and consumed in Asia, where 60% of the world population lives and it covers about 10% of the world's arable land (FAO, 2002). In Asia, 17 million ha of irrigated rice area may experience "physical water scarcity" and 22 million ha may have "economic water scarcity" by 2025 (Tuong and Bauman, 2001). Nepal's economy is more affected by climatic stress such as drought flooding and other natural disasters than any other hazards. Two-third of rice area in Nepal is rainfed and most of them are stress-prone (drought and flood prone) where, low production and high variability occur in rice production due to uncertain weather conditions resulting from drought and/ or flooding during monsoon season (Gauchan et al, 2012).

Efforts were made by International Rice Research institute (IRRI) and National Rice Research Program (NRRP) Hardinath to manage rainfed lowland rice cultivation with drought-tolerant varieties in Nepal. Newly developed drought-tolerant rice varieties viz; Sukhadhan 1, 2, 3, 4, 5, and 6 have shown new hope for farmers in drought-prone areas which is nearly 30 % of the total rice cultivated areas in the country. These varieties have shown great promise in reducing poverty and vulnerability of the people in drought and flood prone areas of South and South East Asia (Pandey et al, 2010; Mackill, 2011). Environmental, biological, socio-cultural, economic and policy factors influence a farmer's decision to select and replace or maintain a particular variety at any given time (Jarvis et al., 2000). Environmental, biological, socio-cultural, economic and policy factors influence a farmer's decision to select and replace or maintain a particular variety at any given time (Jarvis et al., 2000).

When rainfall water infiltrates and retained in the soil, it increases the rate of available soil moisture for crops growth and development (Kajiru, 2006). Saito et al. (2005) revealed that there is a yield increase of upland rice improved varieties when water stress does not exist during the growth stage.

1.2 Statement of problems

The semi-aquatic nature of rice and high water requirements for its cultivation make it much more prone to losses from drought than other cereals. As a result of the reduction in water availability and recent climate change scenarios, rice production is likely to be more severely affected by drought in hilly areas of Nepal. In Nepal, 30% and 15 % of total rice cultivated areas are prone to drought and submergence respectively (Gumma et al 2011). Globally, extreme poverty and food insecurity continues to be a rural phenomenon (Anriquez and Stamoulis 2007). The incidence of poverty in Nepal is higher in the Hills and Mountains than in the plain region or

Terai (NLSS, 2004). People in mountainous areas tend to be poorer and more food insecure than in comparable flat areas (Templeton and Sherr 1999).

The main factors responsible for low upland and lowland rice yield are inadequate supply of various essential inputs like quality fertilizer, improved seed and pesticides, coupled with lack of adequate irrigation facility and knowledge on improved techniques of cultivation.

In addition, the poor farming techniques, insufficient incentive to augment production under the traditional system of land tenure, and lack of agricultural credit and marketing facilities in the study area are the factors responsible for low agricultural production and benefits. Particularly in the case of rice cultivation; drought, credit supply, input supply, soil problem, weeds, pests and diseases are recognized as the major production problems in Nepal (Television Trust for Environment, 2004).

1.3 Rationale of study

Considering the importance of rice production in the national economy and the problems faced by farmers, this study aims to assess situation, economics, potentials and constraints of rice production. One of the important ways to ensure food security and at the same time provide viable incomes for poor rice farmers in the future is to develop new rice varieties that are more tolerant of the adverse effects of a more volatile climate (Mackill et al., 2010a; Haefele et al., 2010). These newer rice varieties can help minimize production losses from the expected increase in abiotic and biotic stresses due to climate change, can maintain normal productivity, ensure food security and uplifts the economic condition of the farmers.

1.4 Hypothesis Testing

The research will begin by testing whether the recommended varieties perform as expected and found socioeconomically feasible and preferable using the following hypothesis;

Null hypothesis; Sukha varieties showed good performance in Tanahun.

Alternate hypothesis; Sukha varieties did not show good performance in Tanahun.

1.5 Objectives

1. To determine total production costs, physical productivity, total revenue and gross margin of sukkhka, local, improved and hybrid rice in the study area.
2. To find out socioeconomic factors of Sukkhka, local, improved and hybrid rice growers in Tanahun District of Nepal.

3. To compare B:C Ratio and Net profit of different rice varieties.
4. To know which variety is most preferred by farmers while eating. This study also aims to find the cause of preference/ reasons for its preference.

2. MATERIALS AND METHODS

2.1 Study area:

The research work was conducted in 40 households of Tanahun district of Nepal in January to February, 2018. Tanahun district lies in the geographical coordinates of 27.9447° N and 84.2279° E. The selection of growers has been carried out based on the criteria of adopter and non-adopter of Sukhkha rice. Primary data was collected from sample of 40 rice growers from different places like Rupakot, Purkot, Bhanu, Bandipur and Anbukhaireni.

2.2 Research design:

The study was mainly based on primary information collection from rice farmers of Dudhikuna, MirlungBhangyang, Ratanpur, Chudi, Satrasaya, khairenitar, chambas and Bandipur. These places were purposively selected for the study due to availability of drought tolerant rice growing farmers. Sampling frame was prepared from key informant's interview in each location. This study used survey research design in order to collect information from respondents.

2.3 Data collection:

Information about Rice production and other necessary aspects was collected variety and operation wise, by employing comprehensive and pre tested questionnaire. In order to enhance the response rate, data was collected through interview .Although questionnaire was prepared in English language while the interview with respondents was done in local language i.e. Nepali. Different features were covered in the questionnaire. Missing information required was obtained from telephone conversation with the respective farmers.

2.4 Questionnaire development:

In all statistical surveys questionnaires are considered as the medium for recording the information obtained in a standardized manner. Keeping in view the comparative analysis of the economics of Sukhkha, Local, other improved and Hybrid Rice production, semi structured questionnaire was developed; Questionnaire included important questions to obtain information about comparative all rice varieties production along with other socio-economic characteristics of the farm house hold.

2.5 Data collection procedure:

Randomly selected paddy growing farmers from each location were the primary informants. Total 40 household surveys were taken from different places :Dudhikuna, MirlungBhanghyang, Ratanpur, Chudi, Chirkane, khairenitar, chambas and Bandipur. 5 farmers who are mostly sukhkha rice producing were selected from each location. The information about sukhkha rice farmers were obtained from key informants in each location.

2.6 Pre-testing of questionnaire

The questionnaire was pre-tested prior to administrating to actual respondents for checking the reliability and validity of questions. The pre-testing was done on 5 households of Bhanu Municipality and correction was made in finalized questionnaire.

2.7 Data analysis:

After completing the field work, the data were edited and transferred from the questionnaires into worksheet as a database file (SPSS). The variable names within the database file refer to the numbers of each question in the questionnaire; to compare the productivity of Sukhkha, local, improved and hybrid varieties through production cost analysis, total revenue, gross margin, benefit -cost ratio and productivity analysis. Results were presented in charts, figures, and tables. Interpretations were made on the basis of results, which were assisted by qualitative and quantitative data available from primary and secondary survey.

2.8 Descriptive analysis

The descriptive analysis was used to describe the socio demographic characteristics of drought tolerant and other paddy growing farmers. Different variables like family size, age of HH, education, occupation and ethnicity of HH were analyzed by descriptive statistical tools such as frequencies, percentage, mean were applicable.

Farm cost Analysis

The farm cost analysis is based on Sukhkha, local, improved and hybrid rice production. The results of this study will provide for the comparison of total costs and returns Rice varieties. Total costs consist of expenditure from the profit and loss account (fixed costs and variable costs etc.). For the estimation and calculations, following procedure is adopted to examine the profitability of different varieties of Rice:

Total revenue: Total revenue is the total money received from the sale of any given quantity of output. The total revenue is calculated by taking the price of the sale times the quantity sold.

Total revenue = price x physical productivity

Total costs: Total Cost is the sum of the fixed cost and total variable cost for any given level of production.

Total Cost fixed cost + total variable cost

Total fixed costs: Total fixed costs are the costs that do not change with the level of production. For example, water Charges, Govt. Land Taxes.

Total variable costs: Total variable costs are the costs that change in direct proportion to changes in volume

Profit: Profit is the excess of receipts over the spending of business during any period

Profit = gross income - expenses

Gross margin: A gross margin is calculated by taking variable costs away from the gross income earned from an enterprise.

Gross margins are often reported on a per rupees basis for cropping enterprises.

Gross margin = returns –variable costs.

B: C Ratio: Benefit Cost Ratios of different rice varieties has been calculated for finding the most profitable rice variety in terms of total and net revenue. More specifically the Benefit Cost Ratio (BCR) for each variety was:

$$BCR = VNR / TC$$

Where,

VNR = Variety net revenue and

TC = Total cost of production of the variety

More and more the value of Benefit Cost Ratio more will be the net return.

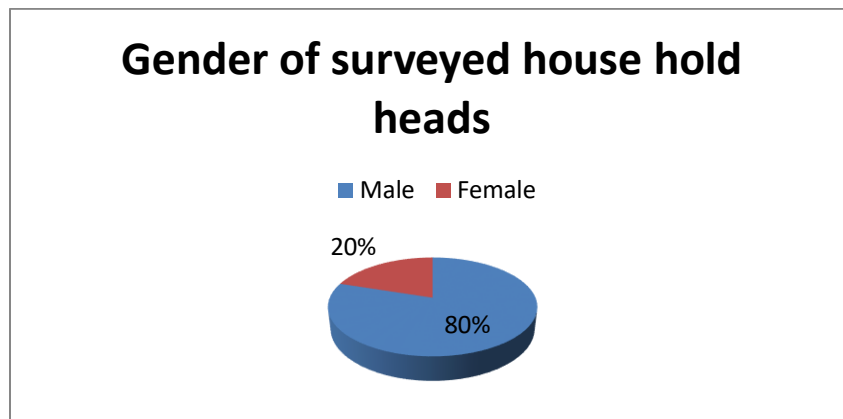
Productivity: Productivity (ton/ha): rice yield (kg) in 1 ropani*20/1000

3. RESULT AND DISCUSSION

3.1.1 Demographic and socio-economics of sampled farmers:

The socio-economic characteristics of the households include age distribution, population and sex distribution, economically active population, education, ethnicity and occupation.

Demography:

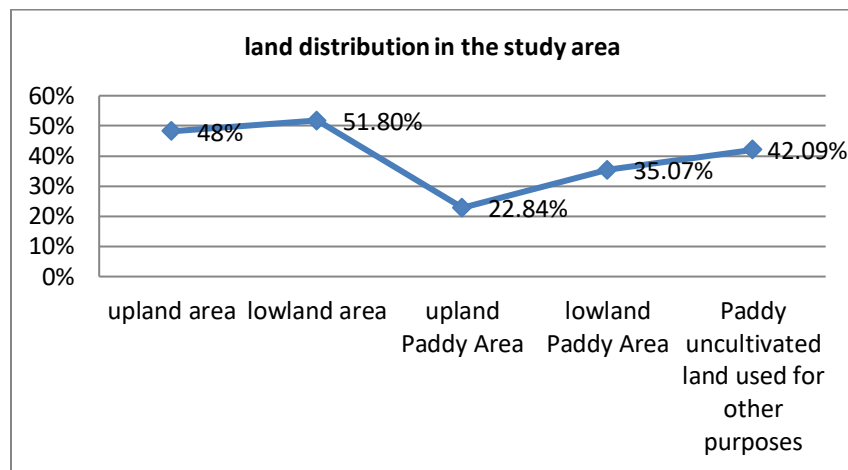


3.1.2 Ethnicity

The distribution of the population by ethnicity revealed that majority of the population residing in tanahun district constituted Bramhin/Chettri 57.5%, followed by Adibasi/Janajati 20%. Dalit constituted 15% and other caste were 7.5% of the sampled population.

3.1.3 Land distribution

In this study, 17.1 ha of land was surveyed which comprises 48.2% upland and 51.8% lowland area. The average land holding was observed to be 8.55 Ropani (i.e 0.4274 ha). Upland rice was cultivated in 22.84% of the total area, lowland paddy in 35.07%, and 42.09% of the total land was rice uncultivated land used for other purposes like housing, growing other crops etc.



3.1.4 Education status

The literacy rate of the respondents was found to be 70% and among them only 20% have studied above SLC or above and 50% of the population has studied below SLC.

Table: Education status of different ethnic groups in the study area

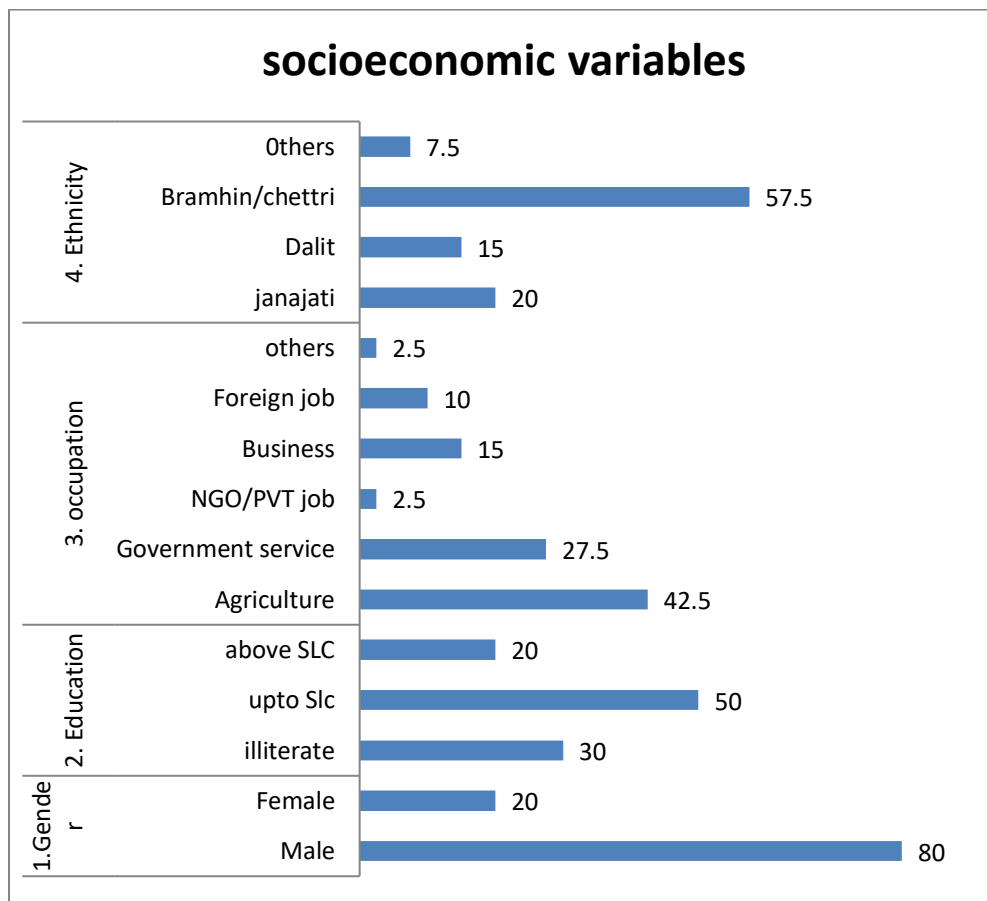
Education status	Ethnicity				Total (%)
	Janajati(%)	Dalit (%)	Bramhin/Chettri	Other caste (%)	
Illiterate	7.5	5.0	12.5	5.0	30
Up to SLC	7.5	10	30	2.5	50
Above SLC	5.0	0	15	0	20
% of total population	20	15	57.5	7.5	100

3.1.5 Occupation

Agriculture is still the major occupation and income source of the study area where 42.5% of the population is involved in agriculture followed by government service 27.5% and business 15%.

10% of the people have foreign job, 2.5% have private job and remaining 2.5% population was involved in other income generating activities.

Demographic characteristics		Frequency	Percentage%
1. Gender	Male	32	80
	Female	8	20
	Total	40	100
2. Education	Illiterate	12	30
	Up to SLC	20	50
	above SLC	8	20
	Total	40	100
3. occupation	Agriculture	17	42.5
	Government service	11	27.5
	NGO/PVT job	1	2.5
	Business	6	15
	Foreign job	4	10
	Others	1	2.5
	Total	40	100
4. Ethnicity	Janajati	8	20
	Dalit	6	15
	Bramhin/chettri	23	57.5
	Others	3	7.5
	Total	40	100

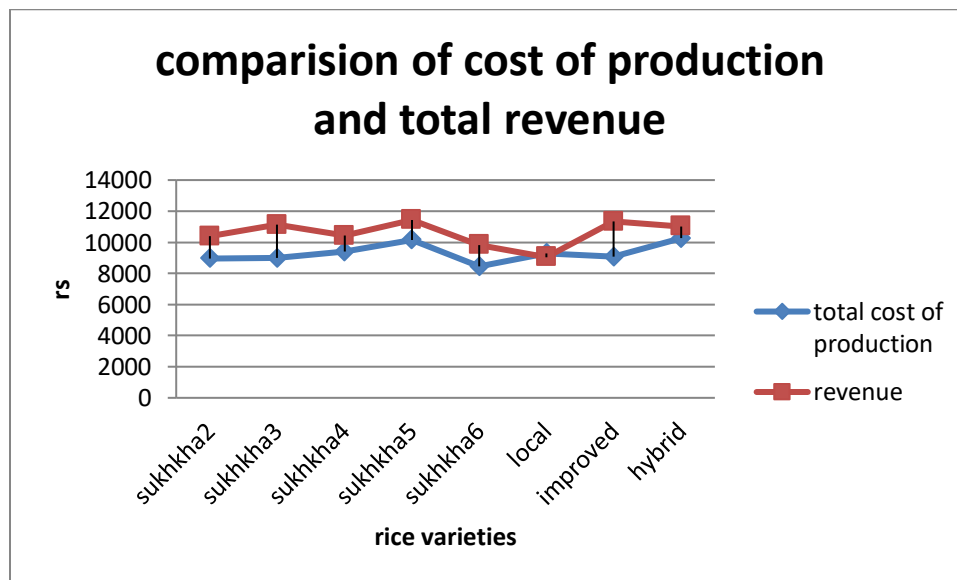
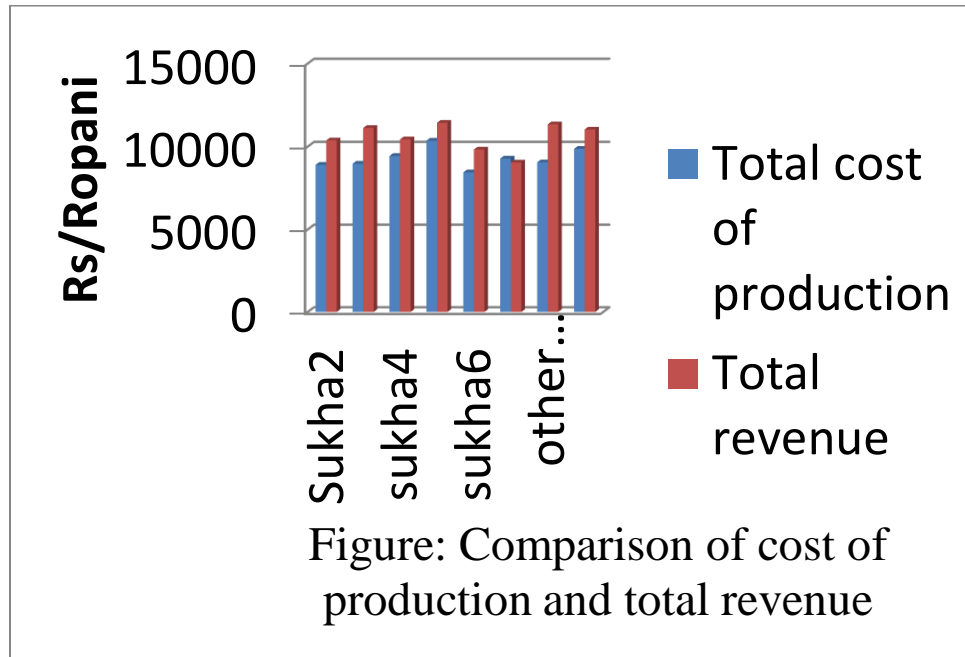


3.2 Economic analysis

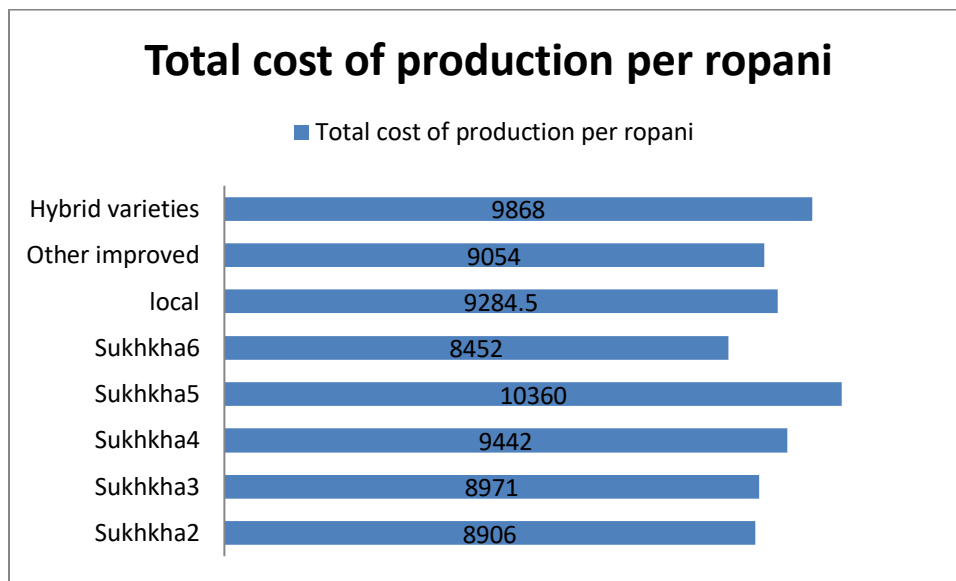
	Sukkhkha2	Sukkhkha3	Sukkhkha4	Sukkhkha5	Sukkhkha6	Local	Other improved	Hybrid varieties
Seed rate	2.7	1.75	2.3	2.84	4.5	4.75	3.4	4.0
Seed cost	196	390	200	267	355	243	235	440
Total wage expenses	7413	7556	8125	8883	6987	7846	7591	8288

Total fertilizer cost	845	650	655	723	755	735.5	760	733
Pesticide cost	22	15	12	20	55	25	13	33
Fixed cost	430	360	450	467	300	435	455	374
Total cost of production	8906	8971	9442	10360	8452	9284.5	9054	9868
Total revenue	10375.5	11121	10435	11433	9825	9045	11340	11026.5
B: C Ratio	1.157	1.236	1.105	1.103	1.162	.974	1.25	1.1174
Gross margin	1899.5	2510	1443	1540	1673	195.5	2741	1532.5
Productivity in ton/ha	4.21	4.53	4.15	4.75	3.75	3.68	4.73	4.55

3.2.1 Cost of production and revenue analysis:



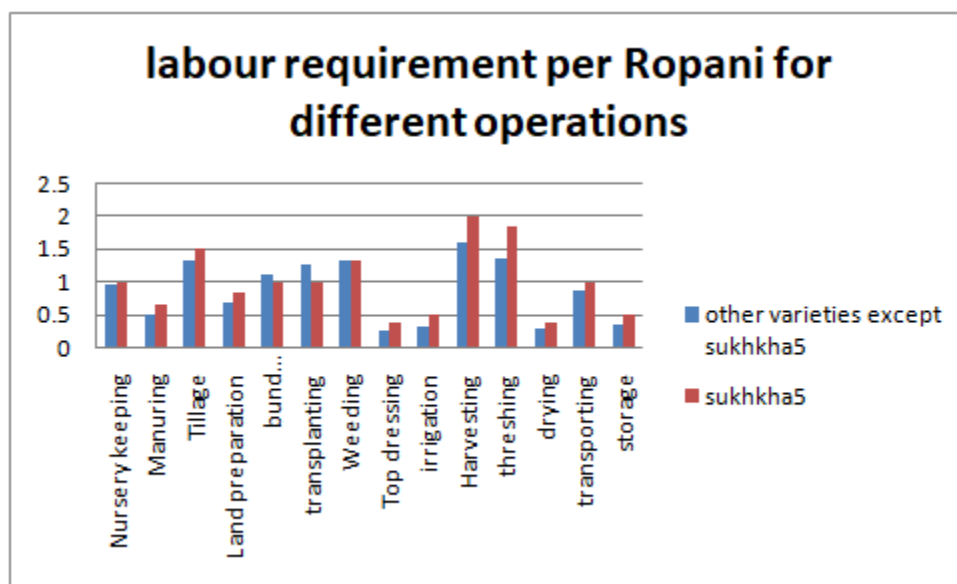
Total cost of production (fixed + variable cost) per Ropani for sukhkha2, sukhkha3, sukhkha4, sukhkha5, sukhkha6, local, other improved and hybrid rice varieties were NRs 8906, 8971, 9442, 10360, 8452, 9284.5, 9054 and 9868 respectively.



3.2.2 Total wage expenses comparison

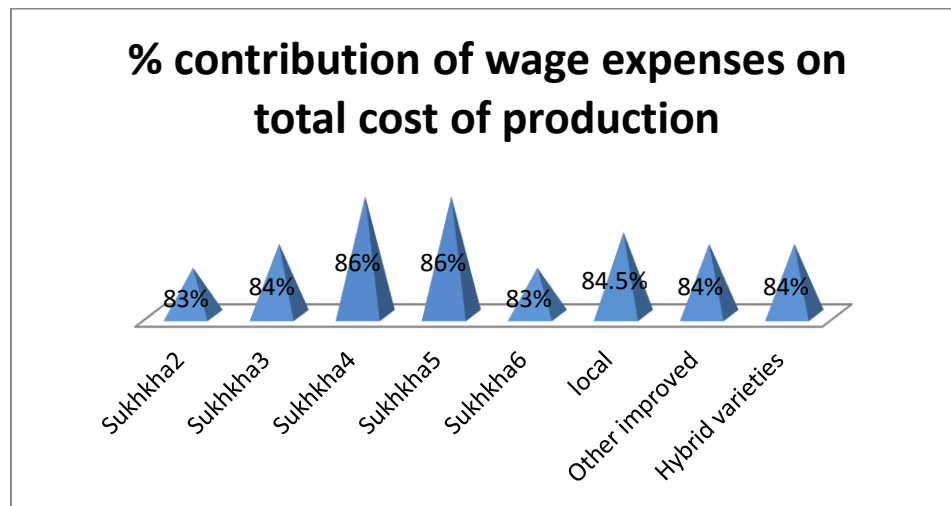
Maximum cost of production was observed in sukhkha5 due to higher amount of wage expenses which was 13.37% more than the average wage expenses for all rice varieties (i.e. Rs 7836/Ropani). Hybrid rice varieties ranks second regarding higher cost of production due slightly higher seed cost and more wage expense. Similarly, the wage expense for hybrid variety was 5.8% more than the average wage expenses for all paddy varieties.

Farmers with higher cost of production can get higher return from their crop (Khan et al., 2009).

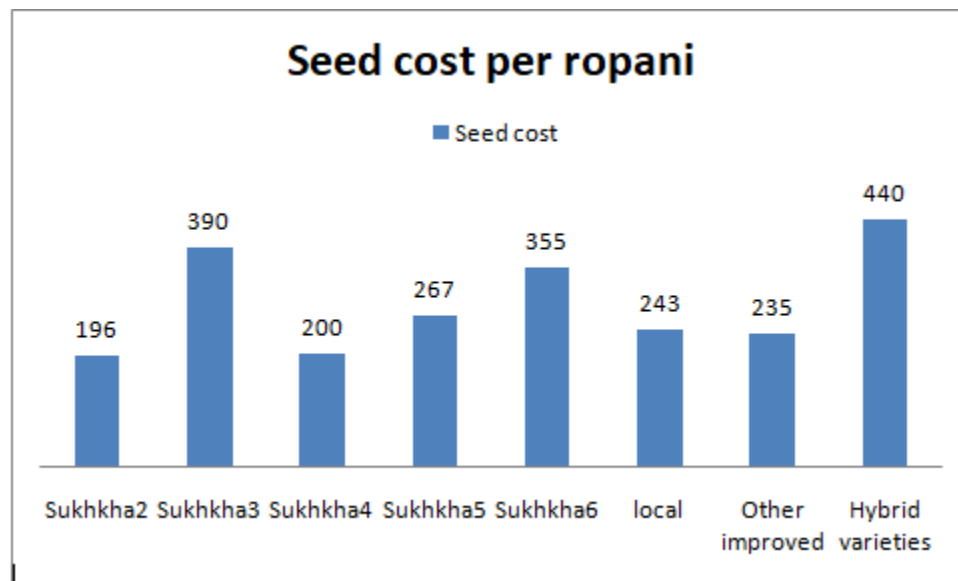


More number of labor were required for sukhkha5 than other varieties in operations like Nursery keeping, manuring, Tillage, Land preparation, Weeding, top dressing, irrigation, harvesting, threshing, drying, transporting and storage. This is because 91.67% of total land holding of the sukhkha5 growing farmers lies in upland/hills.

Similarly, other cost was also more in case of sukhkha5. Farmers with higher cost of production can get higher return from their crop (Khan et al., 2009).

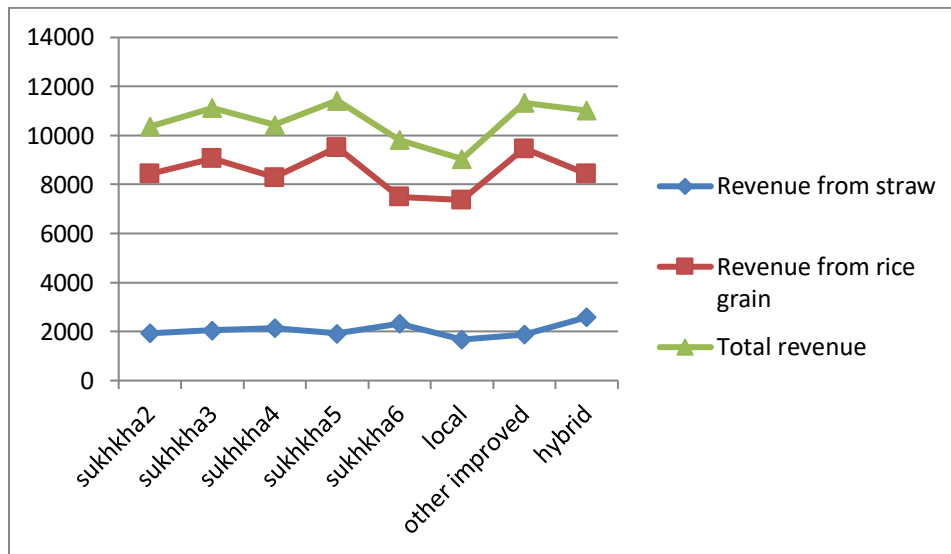


3.2.3 Seed cost analysis:

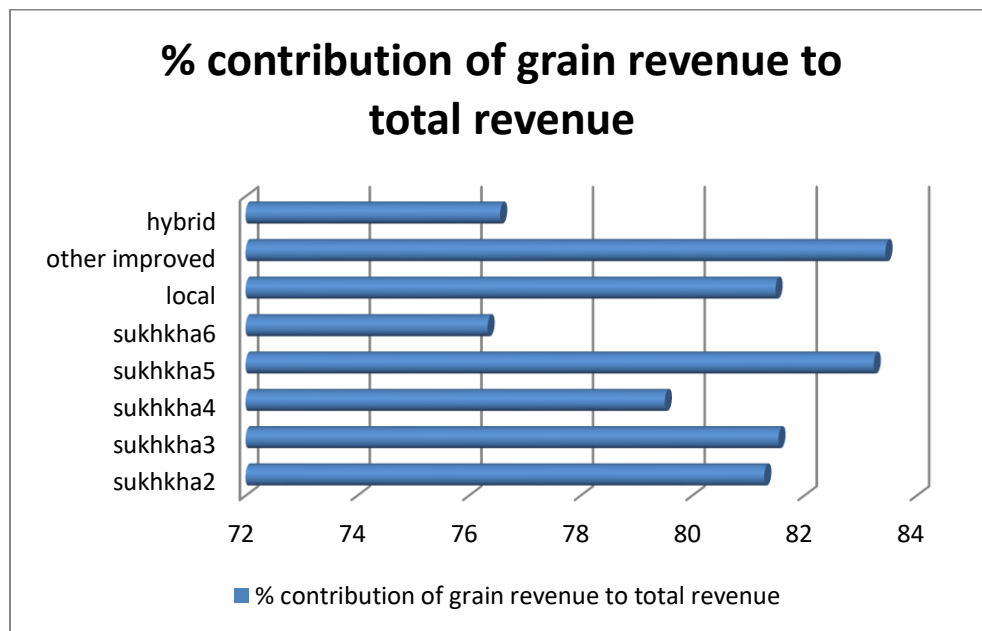


The average seed cost of hybrid rice was Rs 440 per ropani but the average seed cost of other varieties was Rs 270/Ropani. Minimum seed cost was found to be Rs 196/Ropani of Sukhkha2.

3.2.4 Total Revenue analysis:

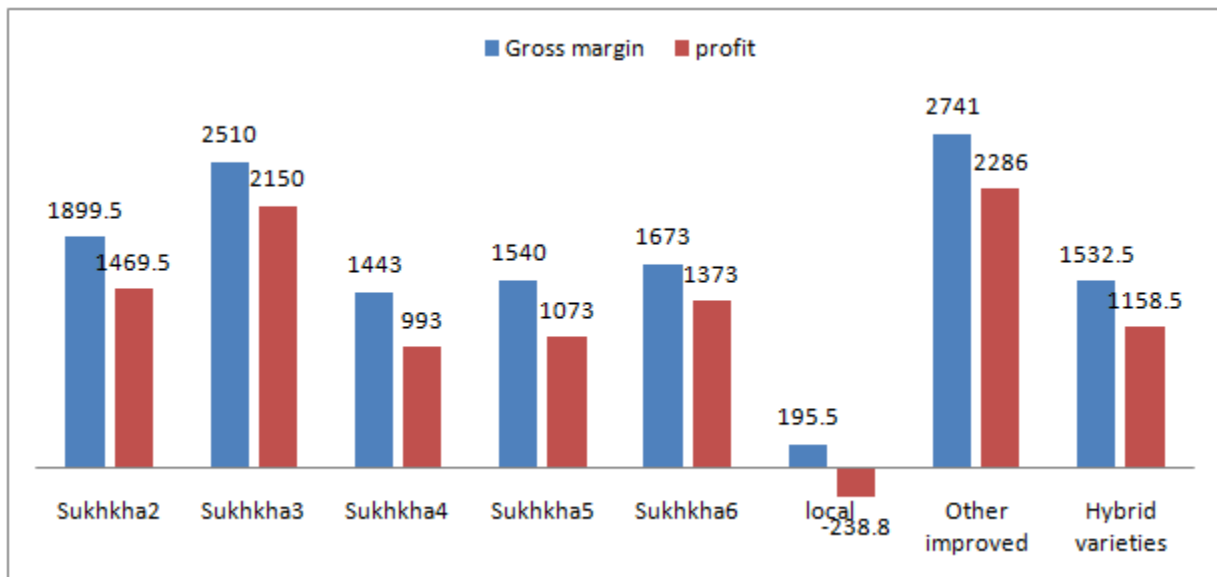


From a Ropani of land, total amount of revenue obtained from Sukhkha2, sukhkha3, sukhkha4, local, improved and hybrid variety was NRs 10375.5, 11121, 10435, 11433, 9825, 9045, 11340 and 11026.5 respectively. Maximum revenue was obtained from Sukhkha5 followed by other improved and hybrid varieties. Minimum revenue was obtained from sukhkha6 and local varieties because the share of income from grains was minimum in these 2 varieties which can be clearly understood from the diagram below:



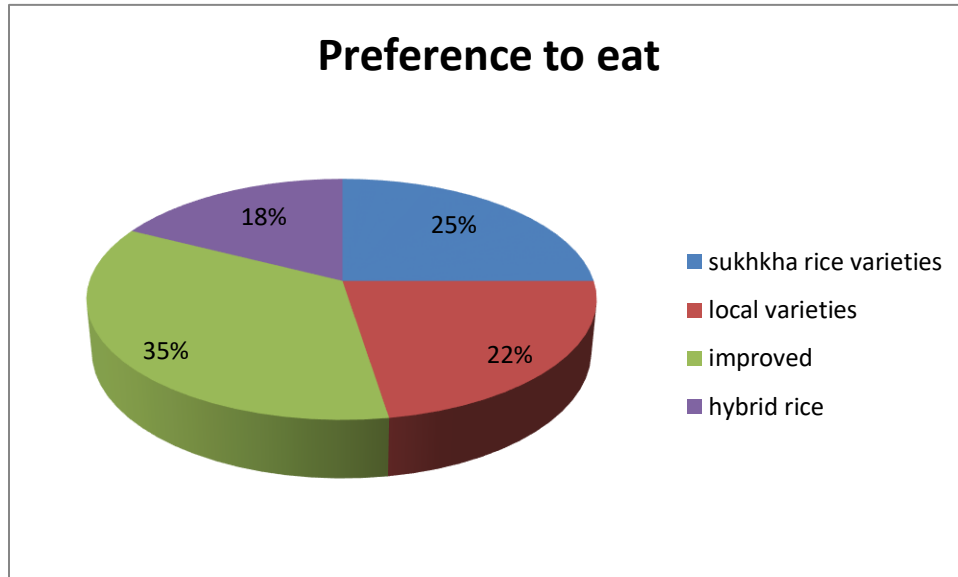
About 83% of total revenue from sukhkha5 and other improved varieties was accounted from grain whereas the share of grain to total revenue was minimum in sukhkha6 and hybrid varieties.

3.2.5 Profit and Gross Margin Analysis:



Maximum profit and gross margin was observed in other improved varieties followed by Sukhkha3. Local varieties were economically unviable to cultivate.

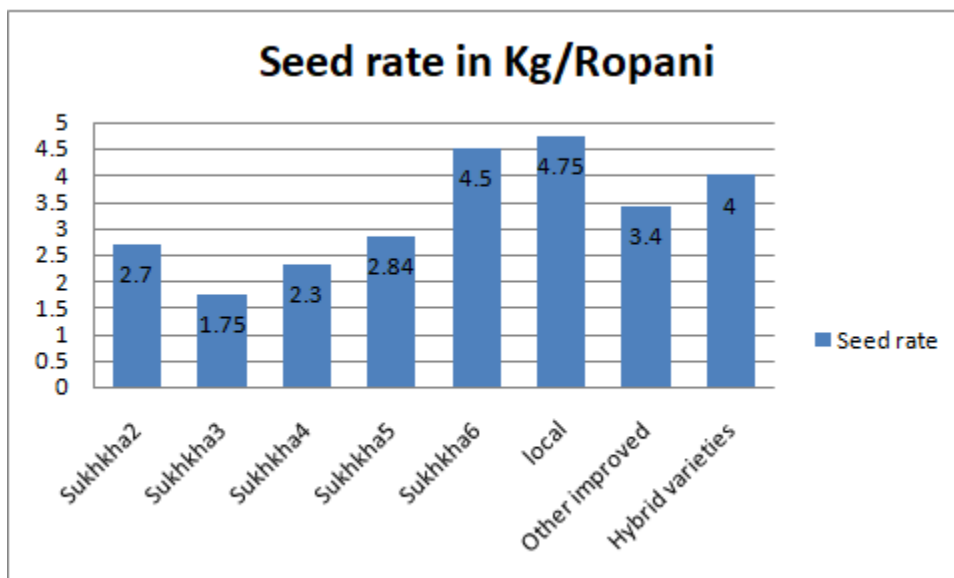
3.3 Preference while eating:



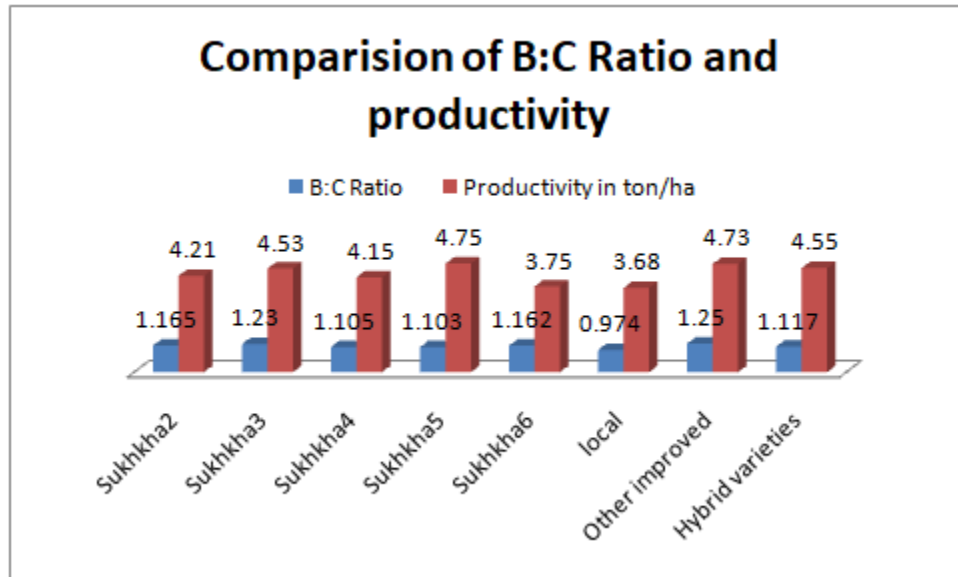
35% of the respondents preferred other improved varieties to eat because improved varieties are fine to eat and they are nutritious too but local varieties are coarse in nature.

3.4 Seed rate comparison:

Farmers used 4.75 kg/Ropani of seed for local varieties like Anadi, Mansuli, Sano dale etc. lowest amount of seed per Ropani was used in Sukhhka3. Lack of knowledge regarding seed requirement and method of cultivation was observed.



3.5 B:C ratio and productivity analysis:



Maximum B: C Ratio was observed in other improved varieties followed by sukhhkha3 variety. Sukkhkha5 being a drought tolerant variety, has productivity of 4.75 and minimum productivity was observed in local varieties like Sano dalle, Mansuli and AnadiDhan.

Under drought condition, drought tolerant varieties in Nepal have a good mean yield of 3.5 to 4.2 tons per ha (Yadav, 2014).

Similar result was also found in a research conducted by Nwaobiala, C.U. & Adesope, Olufemi.(2013) in Ebonyi State, South east Nigeria, Upland rice farmers had a Benefit Cost Ratio of N1.55 (1.56USD). The net profit from Swamp/lowland rice cultivation was 132,090.00 NGN (852.19USD) and a Benefit Cost Ratio of 1.75 NGN (1.75USD).

4. CONCLUSION

- ❖ 80% of the household heads were Male, Agriculture was still the major occupation and majority of the respondents were Bramhin/ Chettri
- ❖ Maximum cost was incurred in Sukha5, highest revenue was also obtained from the variety itself.
- ❖ Sukha6 is the most labor efficient variety but has lowest productivity among other drought tolerant varieties.
- ❖ Other improved varieties followed by Sukha3 provide maximum income per unit cost.
- ❖ Local varieties are economically unviable to cultivate.
- ❖ Improved varieties are mostly preferred to eat.

5. RECOMMENDATIONS

The study makes following strategic recommendations for rapid dissemination of drought-tolerant rice varieties in the study area:

1. Popularization of drought tolerant rice varieties through extension demonstration and awareness creation employing participatory research and extension.
2. Promotion of appropriate size of mini-kits to small farmers in stress-prone domains with input support and subsidies.
3. Providing awareness regarding the difference in cultivation practices of upland and lowland rice varieties.
4. Training and capacity building of seed actors in seed production and marketing.
5. Seed production and marketing of drought tolerant varieties by multiple channels and sources.
6. Targeting of seed and input subsidies with new drought tolerant rice varieties and effective implementation of existing seed policy and regulation.
7. Identification and mapping of target drought-prone domains and target groups for further dissemination.
8. Targeting fast track variety development and release for specific drought-prone domains.
5. Development of effective seed-networks of relevant actors for drought tolerant varieties
9. Timely delivery of market information to upland rice farmers as to enable the sale their products at appropriate price.

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