

# ECONOMIC ANALYSIS OF PADDY CULTIVATION IN KAPILVASTU DISTRICT OF NEPAL

काशी हिन्दू  
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BANARAS HINDU  
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Thesis submitted in partial fulfilment of  
the requirements for degree of

**Master of Science (Agriculture)**

in

**Agricultural Economics**

Supervisor

*Dr. Prashant Kumar Singh*

Submitted by

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**Through** The Head, Department of Agricultural Economics,  
Institute of Agricultural Sciences. B.H.U, Varanasi.

Dear Sir,

I have great pleasure in forwarding the thesis entitled **Economic Analysis of Paddy cultivation in Kapilvastu district of Nepal** submitted by **Ms. Sipora Mahato I.D No. 20412AGE021**, in partial fulfillment of the requirements for the degree of **Master of Science (Agriculture)** in **Agricultural Economics**, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi and placing on record that he has completed the requisite residential requirements as contained in the statute of the University.

I certify that the entire scheme of investigation presented herein was planned and carried out solely by the candidate under my guidance and supervision. The data presented in the thesis, to the best of my knowledge and belief, are genuine and original.

Thanking you

Yours faithfully

**Forwarded**

**Dr. Prashant Kumar Singh**  
(Supervisor)

(Head)

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**Date**

**Place:** Varanasi

(Sipora Mahato)

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# **LIST OF SYMBOLS AND ABBREVIATIONS USED**

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Ha	Hectare
Masl	Meters Above Sea Level
MoALD	Ministry of Agricultural and Livestock Development
NARC	Nepal Agriculture Research Council

## **INTRODUCTION**

---

Agriculture is the most important sector for a country's economic development. It is true, the country's economic development is dependent on other sectors such as industrialization and tourism. Agriculture, on the other hand, is the foundation upon which the entire superstructure of industrial and other economic growth must be built. Agriculture is the most important human activity in terms of providing food, fiber, raw material and other products to the world's population. It is the sole or primary source of income for more than half of the population in many Third-World Countries.

Rice, particularly threshed unmilled rice, is the main product of paddy. Rice (*Oryza sativa*) is a starchy cereal in the Poaceae family. Out of the twenty-three rice species, *Oryza sativa* (Asian rice) and *Oryza glaberrima* (African rice) are known for their commercial cultivation value (Subedi et al., 2020). *Oryza sativa* is the most widely cultivated rice species in the World. There are thousands of varieties of rice, but they are classified as white or brown (whole grain) depending on how they are processed. White rice is the most popular, but brown rice has more health benefits. Brown rice is available in a variety of colors, including reddish, purplish, and black. Rice is used to make a variety of products, including rice flour, rice syrup, rice bran oil, and rice milk. White and brown rice are both high in carbohydrate and protein, with little fat or sugar.

Since its domestication around 8,000 to 10,000 years ago, rice has fed a large number of people all over the world (Paudel et al., 2021). Rice is a staple food for more than half of the global population. It accounts for 30-60% of the dietary calories consumed by nearly 3 billion people worldwide. After wheat, it is the World's second most cultivated cereal (Fageria, 2007). Rice cultivation has aided Asia's food security significantly, as the region produces and consumes more than 90 percent of the World's rice. Rice feeds 100 million Asian households, which plant paddy on 60 million ha of land. It is estimated that by 2025, the World's farmers will produce 60%

more rice than they do now (509.87 million metric tons in 2021/22) to meet the demand of the World's growing population (Shahbandeh, 2022). Worldwide, South and East Asia are considered as the main regions for paddy production. Within this area also, China and India are considered as the major producers of paddy. In 2020, China's paddy production exceeded to over 211.86 million metric tons, while India's production exceeded 178 million metric tons. In the Asia Pacific region, China and India were the leading rice producers with a significant gap to Indonesia in third place (Shahbandeh, 2022).

Rice is grown in both upland and lowland areas, but irrigated lowland rice systems account for approximately 76% of total global production and 55% of harvested rice area (Fageria et al., 2003). The International Rice Research Institute (IRRI, 1984) classified rice into five categories based on the seasonal water regime. The five categories are as follows:

- (i) Irrigated lowland
- (ii) Rainfed lowland
- (iii) Deep water
- (iv) Upland and
- (v) Tidal wetlands.

Irrigated lowland agriculture is practiced on flat land with water control, where water is flooded for the entire or a portion of the growing season (Fageria, 2007).

Nepal's economy is heavily reliant on agriculture. Agriculture is the second largest contributor, accounting for 23.13 % of total Gross Domestic Product (GDP) in Nepal in 2020. Furthermore, it provides employment to 65.6% of Nepal's population (Basyal et al., 2019). Rice, wheat, and maize are three major cereal crops grown in Nepal. Among three crops, Rice is the dominant and most important staple crop, which is playing a significant role in agriculture and economic development at the same time supporting to food security of the Country (Paudel et al., 2021). It ranks first in terms of livelihood generation, land area, and production. On an average,

Nepalese consume 120kg milled (or 200kg paddy) rice, and rice accounts for approximately 40% of calorie intake, so it can be said that it contributes to the Country's livelihoods and food security. Rice is the main staple crop in Nepal, growing at an altitude ranging from 60 m in the Terai to 3050 m in Chumchure and Jumla (Bhujel & Ghimire, 2009) (Joshi et al., 2020). Nepal is divided into three distinct ecological zones, and rice is grown in each of them:

- (i) The Terai and Inner Terai (60-900 masl)
- (ii) The mid hills (900-1,500 masl)
- (iii) The mountains/high hills (1,500 - 3,050 masl)

Terai and Inner Terai accounts for the majority of rice cultivation area (69.7 %), followed by the Mid-hills (25.8 %) and the mountains (4.4 %) (CDD, 2015). Of the total production of the Country, approximately two-thirds of total production is produced in the southern plain. Because of a lack of year-round irrigation, the majority of paddy produced in the country is rain-fed (Basyal et al., 2019b). In 2019/20, paddy area harvested for Nepal was 1,458,915 hectares with production of 5,550,878 metric tonnes and the yield per hectare was 3.80 metric tonnes per hectare (MoALD, 2021). Whereas it was only 2.34 metric tonnes in 1971. This shows that paddy production of Nepal has increased from 2.34 to 5.55 metric tonnes growing at an average annual rate of 2.72%. Out of total cereal imports, imports of rice and paddy amounted to NRs 27.62 billion and NRs 20.54 respectively (Prasain, 2022). Despite of increasing trend in production for now there is possibility of decreasing trend again in the near future. According to the Intergovernmental Panel on Climate Change (IPCC) estimates for 2050, changing rainfall patterns and rising temperatures, as well as flooding, droughts, and salinity, will likely reduce rice and wheat production.

The major production of rice is done in Terai belt of Nepal thus it is also called as “Grain basket of Nepal” (Bhusal et al., 2020). The Terai region accounts for roughly 70% of the country's rice output, while the hills produce 26% and the

mountains produce 4%. (CDD, 2015). Kapilvastu is one of the districts of Lumbini province. Because of its plain landscape, it has high potentiality for paddy production. The district is situated at the height of 93 to 1,491m above sea level. It lies between 27° 32' 40.44" N latitude to 83° 3' 26.51"E longitude. Geographically, the district is divided into low land plains of Terai and the low chure hills. The summer is hot with temperature above 27° C and winter is cold with temperature below 14°C. In Kapilvastu during the entire year, the rain falls for 93 days and collects up to 640mm of precipitation. Among the other months, July and August receives the most rainfall. In 2019/20, paddy area harvested for Kapilvastu was 66,495 hectares with production of 233,470 metric tonnes and the yield per hectare was 3.51 metric tonnes per hectare (MoALD, 2021). Modern rice varieties were introduced in Nepal in late 1960s. Some of the popular rice varieties cultivated in Kapilvastu district includes Sawa, Ramdhan, Radh-4 and Gorakhnath. Some other varieties are also grown which includes varieties such as Golden mansuli, Loknath, Hybrid (6444), kalanamak, Sabitri, Hardinath, Swarna sawa-1, Sawa saba-1, Sindhur, mahima and Motisabha (Sapkota & Sapkota, 2019).

Land, water, nutrients, and energy are critical components for rice production, but these resources are becoming scarce and increasingly expensive. These element's temporal and spatial availability are constrained by one or more factors. With increasing population and migration in Nepal, the potential for reclaiming land for agricultural purposes is limited. As a result, there is no room for horizontal growth in agricultural productivity. The only option is to increase production vertically by increasing cropping intensity (Swain, 2016).

Although water is a renewable resource, its availability is constrained by demand. Water for agricultural operations is limited and likely to decrease in the near future due to increased demand in civic, industrial, entertainment, and other purposes. Water will soon become a major constraint in producing enough food, fuel, feed, and fiber, particularly in developing countries (Swain, 2016).

Another important input for increasing output is the use of chemical fertilizer. Nepal imports chemical fertilizer on a net basis. Another important factor that may

limit production and availability in the future is the limited availability of non-renewable energy used to produce chemical fertilizer, as well as cost escalation. On the other hand, the environmental pollution caused by the careless use of chemical fertilizer should be examined.

Rice farming necessitates physical labour from land preparation to harvesting and storing grains. However, we can see that labour scarcity is very high during the rice farming season, and even if labour is available, the labour charge is very high, which is inefficient in terms of both time and cost. Labor shortages are primarily caused by rural-urban migration and foreign employment. This situation necessitates the mechanization of rice production in order to increase output, profitability, and resource efficiency of the inputs used in production. Mechanization ensures efficient use of time, sometimes even improving product quality. Small landowners can also use farm machinery/equipment from the custom hiring center.

Despite of lots of possibilities in paddy cultivation, there are several limitations regarding the production promotion of rice. In Nepal, investment in rice research is currently very low, with less than 0.1% of the value of rice output. Rice research in NARC also receives a smaller share of the agricultural research budget (only 4% of total research budget), despite the critical role of rice output (20%) in National Agriculture Gross Domestic product (AGDP) (Tripathi *et al.*, 2019). Nepal's Agricultural Perspective Plan (APP), a 20-year vision document for agricultural development (1995-2015), as well as the recently developed Agricultural Development Strategy (2013), envision an agriculture-led economic growth strategy. Such an economic growth strategy is expected to be inclusive and to reduce poverty directly. Rice is Nepal's most important food crop, accounting for half of the Country's food supply and 40% of total daily caloric intake. In Nepal, food security is synonymous with rice security. On the one hand, increasing rice production and profitability is critical for poverty reduction; on the other hand, Nepal has the lowest rice yield of any South Asian country, and the government's investment in rice research and development is minimal. To achieve the vision and mission of Nepal's

rice research and development programme, a set of priority areas have been identified.

- (i) Development and promotion of high yielding, stresses tolerant and better-quality rice varieties
- (ii) Integrated natural resource management for sustainable rice production
- (iii) Development and promotion of small-scale mechanization and post-harvest technologies

To increase the production and productivity of rice, modernization in agriculture sector is important. Keeping this view, Government of Nepal under Prime Minister Modernization Project (PM-AMP) started Rice zone program in Kapilvastu district in 2017/18 and later in 2019/20, it was upgraded to Rice Super zone. At present Rice Super zone covers three municipalities i.e., Banganga, Kapilvastu and Buddhabhumi and two rural municipalities i.e., Mayadevi and Suddhodhan of Kapilvastu district. The environmental and climatic condition of Kapilvastu district makes it one of the major rice producing districts of Nepal for the research. Keeping in view the above aspects, the present investigation entitled “**Economic analysis of paddy cultivation in Kapilvastu district of Nepal**” was carried out with the following objectives.

- 1) To study the socio-economic profile of the farmers in the study area.
- 2) To estimate cost and returns from the cultivation of paddy crop.
- 3) To study the major input constraints faced/perceived by paddy growing farmers in the study area.

### **Scope of the study**

The study's findings will help farmers and extension workers understand the cost of cultivation as well as the returns from paddy cultivation. The findings will be

useful to credit agencies when making loans for paddy cultivation. The research will also be useful to scientists in the future for further research on this cereal crop.

**Limitations of the study**

The study's findings cannot be generalized because:

1. Only those factors that are under the respondent's control and contribute significantly to production and returns are considered in this study.
2. The information is only available for one crop season in the agricultural year 2021.
3. Because of the small sample size and narrow scope of the study, the current study's findings cannot be generalized.
4. The study's condition may be applicable to the study area and some other areas with similar climatic, geographical, and soil conditions, but not to all areas of the Province and Country with different Agro-climatic conditions.
5. Because cultivators do not keep track of farm expenses, the primary data collected for the study is entirely based on their memory.



## **REVIEW OF LITERATURE**

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A thorough and up-to-date review of the literature is required in any field of scientific inquiry in order to understand the various concepts to be used in the proposed study and, more importantly, to gain a clear understanding of the gaps in previous studies so that the proposed study can make a serious effort to address those gaps in the existing literature. To have a better and clear understanding of concepts, one must first understand what they actually refer to and how various economists have approached it. This chapter reviews the concept, analytical tools, and findings of previous studies that are relevant to the current study.

Review of past studies include,

1. Estimation of cost and return from the cultivation of paddy crop
2. Major input constraints faced/perceived by paddy growing farmers
1. **To find out the cost of cultivation of rice production**

**Bhujel & Ghimire** (2006) carried out a study on "Estimation of production function in Hiunde (Boro) rice" in the Morang district of Nepal. In the study, different inputs were used as variables, and their expenses were used as variable costs. The average total variable cost of winter rice cultivation was Rs 19878.49/ha, while the gross income from grain output was Rs 34385.90, resulting in a benefit cost ratio of 1.73. One ha of winter rice production yielded Rs 14507.41 in net profit.

**Suresh & Reddy** (2006) mentioned that the cost of paddy cultivation in the study area was Rs 21603/ha, yielding a BC ratio of 1.34. Human labour accounted for the largest part of the inputs (62.47%), followed by FYM (11.67%). Seeds, tractors, and PPC, for example, accounted for 4.54, 11.14, and 1.21% of the total cost, respectively. The entire return, comprising both the primary product and by product, was Rs 28,999/ha.

**Kherwa** (2009) in his study of profitability analysis and resource use efficiency of wheat, the cost of cultivation was estimated by using the cost concept given by CACP. The study showed that the cost of cultivation per ha of wheat crop was found to be Rs.7688.71 (Cost A1), Rs.9247.11 (Cost B1), Rs.12247.23 (Cost B2), Rs.10605.92 (Cost C1), Rs.13605.66 (Cost C2), and Rs.14656.85 (Cost C3). The average variable cost (working cost) accounted for the largest portion of the total cost of Rs. 13443.49 per ha of wheat production, accounting for 86.52%. The component wise investment pattern on total cost revealed that labour costs accounted for 34.46% of total cost, followed by other and material costs, which accounted for 35.77% and 29.75%, respectively. This demonstrates that the involvement of additional costs was excessively high in comparison to the material cost, which is the true and real resource for production, which was found to be the cheapest. Wheat productivity on the sample holding was determined to be 25.23 quintals per ha on average. This crop's entire gross income per acre was calculated to be Rs. 33238. Farm business income was determined to be Rs.24671, followed by farm investment income of Rs.22258, family labour income of Rs.20113 and net farm income of Rs.18581, correspondingly.

**Adhikari** (2011) carried out a study on the topic "Economics of organic rice production in the Chitwan district of Nepal". According to the study, the average productivity of organic rice is 3.15 Mt/ha. The average total revenue from organic rice cultivation is NRs. 66597.07 per ha and is accounted for in terms of grain (NRs. 56718.19/ ha) as well as straw (NRs. 9878.88/ha). NRs. 34347.16 is the average gross margin per hectare. It implies that organic farming is financially viable. The average B:C ratio was found to be 1.15 in the study, which indicates that organic farming is profitable in the study area.

**Namdev et al.** (2013) conducted a study to examine the cost and return analysis of organic and inorganic farming practices for paddy cultivation in Jabalpur district of MP. The study discovered that the average total cost of paddy cultivation under organic and non-organic conditions was Rs. 8521 and Rs. 14324, respectively. Inorganic farms had the highest yield per ha of rice crop (21.92 q/ha), while organic farms had the lowest output (14.88 q/ha). Organic paddy was found to be more

expensive than inorganic paddy in the study location. The organic farm had a greater net income and output-to-input ratio. Thus, the incremental net revenue was just Rs. 2186 per ha, demonstrating that organic paddy cultivation was more economically viable and profitable in the research area. In organic paddy, net revenue ranged from Rs. 8203 to Rs. 10122 per ha, whereas inorganic paddy net income ranged from Rs. 6067 to Rs. 8249 per ha.

**Pankaj Kumar** (2013) studied economic analysis of Kharif rice cultivation in the Udham Singh Nagar district of Uttarakhand in India. In the study, they collected data from 60 respondents, which comprised 29 marginal farmers, 17 small farmers, and 14 large farmers. The total cost of cultivation for overall farms was determined to be Rs. 39841.27/ha, with marginal farms having the highest total cost of Rs. 43327.56/ha, followed by small farms at Rs. 41608.17/ha and large farms at Rs. 38594.01/ha, accordingly. In the case of large farms, the rice production per ha was found to be 46.98 qt/ha. The average yield for the overall farm was 47.62 qt/ha, followed by small farmers (46.02/ha) and marginal farmers (46.02 qt/ha). On an overall per ha agriculture basis, the gross return per ha was Rs. 101059.20. The figures for marginal, small, and large land were Rs. 35305.53, Rs. 91055.52, and Rs. 248152.40, respectively. On a per ha basis, material costs accounted for 17.97% of total costs. The highest % was 19.83% for large farmers, followed by 17.32% for marginal farmers, and 16.93% for small farmers. For kharif rice farming, the overall proportion of material costs, including seed, fertilisers, irrigation, and plant protection chemicals, to total costs was 18.81 %. Fertilizers contributed about 60% of the material costs. Seed, irrigation, and plant protection chemicals accounted for 9 to 15% of the total.

**Prakash and Singh** (2013) in their study, they used CACP concept to calculate cost and returns of rice cultivation. Rice cultivation cost an average of Rs 17264. The costs borne by marginal farmers were primarily due to heavy investment in human labour (40%) followed by manure and fertilisers (12%), machine labour (11%), plant protection (2%), seeds (2%), bullock labour (1%), and irrigation charges (1%). Other costs, such as interest on working capital and rental value of owned land, were nearly identical. The rental value of owned land had the highest share of these

items, accounting for 29 % of the total cost per hectare. The gross income was Rs 29110, while the net return over cost C1 and C2 was Rs 14300 and Rs 9295 per ha, respectively.

**Churpal et al.** (2015) conducted their study on “An Economic analysis of rice cultivation and constraint in Dhamtari district of Chattisgarh, India”. From the study they concluded that the cost of cultivating the Mahamaya rice variety was Rs/ha 37090.31. The total cost of input materials was Rs. 12076.71 per ha. Fertilizers were found to be the most expensive at Rs/ha 4712.77, accounting for 39.02 % of total input materials costs, followed by farm yard manure (38.22 %), plant protection chemicals (11.03 %), seed (10.07 %), and interest on working capital (1.65 %). Overall, the yield of the Mahamaya rice variety was 55.79 q/ha. The Mahamaya rice variety produced a gross return of Rs/ha 87432.40. The major operations in paddy cultivation were crop transplanting and harvesting, which required human labour and resulted in costs of Rs/ha 5921.83 and Rs/ha 5437.70, respectively. The cost of family and hired labour was 57.56 and 42.44 % of the total cost of transplanting. The gross income of the sample farm in paddy cultivation was Rs 87432.40 per ha on an average, and the net income was Rs 50342.09 per ha.

**Pradhan et al.** (2015) carried out a study of energy use pattern and cost of production in transplanted paddy. For that, they calculated a productivity and benefit cost analysis. Seedbed and nursery bed operating costs were Rs 1817.39 per ha and Rs 833.25 per ha, respectively, representing 5.15% and 2.36% of total input costs. The cost of operating a nursery bed was the cheapest of all the other costs. Sowing and agricultural operating costs were Rs 9250 per ha and Rs 925 per ha, respectively, accounting for 26.26% and 2.62% of total input costs. Irrigation, fertilizer, harvesting, transporting and bundling, threshing and winnowing costs were Rs 2081.70, Rs.5550.00, Rs. 3409.60, Rs. 5321.25, Rs.3910.00, and Rs 2123.71 per ha, accounting for 5.91%, 15.75%, 9.68%, 15.10%, 11.10%, and 6.03% of total input costs, respectively. The highest expense was associated with fertilizer application. The gross and net returns per ha were Rs. 69025 and Rs. 33803.10, respectively. The economic productivity of rice production was calculated at 0.12 kg/Rs at the conclusion of the economic analysis. The benefit-to-cost ratio was found to be 1.96:1.

**Ebele & Eric** (2017) mentioned in their study of resource use efficiency in rice production in Nigeria, that the average yield of paddy was 4705.2 kg/ha. The gross margin was calculated as total revenue per ha minus total variable costs per ha. Similarly, the profit was calculated as total revenue per ha minus total cost. In the study, the major variable component was labour used for various farm operations. Labor costs accounted for approximately 59% of total variable costs.

**Sujan et al.** (2017) conducted their study of analysing the financial profitability and resource use efficiency of Boro rice in Bangladesh. The per ha variable cost and total cost of production were BDT 57,583 and BDT 71,208, respectively, according to the Farm Budgeting model. The average yield was determined to be 4.112 tonnes, which was higher than the national average yield of 3.965 tonnes the previous year. The average gross return, gross margin, and net return were respectively BDT 86,548, BDT 28,965, and BDT 15,340. On a full cost and variable cost basis, the benefit-cost ratio (BCR) was found to be 1.22 and 1.50, respectively.

**Mohapatra et al.** (2018) used the cost concept given by CACP to estimate the cost of cultivation of paddy. On average, the total cost of rice production for all farms is Rs. 13086.37. Large farms have the greatest rate, followed by small farms, and finally marginal farms. Large farms yielded the most rice per acre (20.58 quintals), followed by small farms (16.45 quintals), and marginal farms (14.12 quintals). Large farms had the greatest cost of production per quintal of rice at Rs1152.72, Rs1124.12, and Rs1225.71, with an average cost of production of all farms at Rs1085.10. For all the rice fields in the research area, the average total revenue is Rs 42842.67. Large farms have the greatest rate, followed by marginal and small farms. The average benefit cost ration for all farms is 2.27, whereas large farms have the greatest rate, followed by marginal and small farms. At a 5% level of significance, the net income received by the three farm sizes per acre differed. This indicates that large farmers earned Rs 60041.6 more than marginal and small farmers, who earned Rs 41354.00 and Rs 27132.40 respectively. Large farmers' superior performance in terms of paddy yields and quantities translated into higher gross and net profits per acre than small and medium farmers.

**Thapa et al.** (2018) in their study of supply chain analysis of the rice sub-sector in Dang district of Nepal, they found in their study that the average benefit-cost (B:C) ratio of paddy farmers was determined to be 1.14:1.

**Dilip** (2019) has used CACP concept to study and analyze the cost and returns of turmeric in Akola district. It was found in the study that the total cost of turmeric cultivation per hectare, i.e., cost 'C3,' was highest in the large size group, at 320584.94 per hectare, followed by the medium size group (310859.56) and the small size group (299825.93), respectively. The average yield and gross returns per hectare increased as farm size increased.

**Dhakal et al.** (2019) examined in his study of benefit-cost analysis, and found that seeds, labour, FYM, and chemical fertilizers have significant effects on rice production. In the findings, the total cost of production was NRs 81,302 per ha for plain area. The gross return was NRs 122,737 per ha and the gross profit was NRs 41435.4 per ha. The B:C ratio was 1.60, which reveals that rice farming in the study area was profitable. Turmeric's benefit-cost ratio at cost 'C3' was 1.65 in the small group, 1.69 in the medium group, and 1.72 in the large group. This indicates that Turmeric crop cultivation was economically profitable.

**Sapkota & Sapkota** (2019) carried out a study on "Analyzing benefit cost ratio for production of different rice varieties in the Kapilvastu district of Nepal" in 2018. The study included four different rice varieties: Gorakhnath, Radha-4, Ramdhan, and Sawa. For all four rice types, the average cost of production was Rs. 77,100/ha. Seed, FYM, fertilizer, human labour, machinery, and irrigation expenditures amounted to 2.14%, 14%, 5.84%, 46.69%, 17.32%, and 0.78% of total variable costs. Inflationary fertilizer prices, rising machinery costs, and rising labour wages are all possible factors for high production costs in the research area. All four rice varieties had a B:C ratio greater than 1, indicating that rice growing is profitable in Nepal's Kapilvastu area. The best benefit to cost ratio is the Sawa variety (1.312) was observed, implying that on an average investment of NRs. 1, farmers receive NRs. 1.312. The average grain yield was highest for Ramdhan, followed by Gorakhnath, Sawa, and Radha-4, which was 4.95 tons/ha, 4.2 tons/ha, 3.75 tons/ha,

and 3.15 tons/ha, respectively. The Gross return was highest for sawa variety followed by Ramdhan, Gorakhnath and Radha-4 which is 101,212.5 NRs/ha, 96,300 NRs/ha, 93,000 NRs/ha and 77,527.5 NRs/ha respectively.

**Bhusal et al.** (2020) conducted the study of "Economics of rice production in the Pyuthan district of Nepal", collecting data from 70 respondents/farmers. Farmers were classified as small (39) and large (31) based on their average rice cultivation area. The average land holding was 0.45 ha, and the average rice cultivation area was 0.34 ha. In both categories, the cost of agronomic operations was found to be significantly greater (more than 70%) than the cost of inputs. Rice grains and straw contributed 72.65% and 27.35%, respectively, to the overall return. Large farms have a higher benefit-to-cost ratio. The B:C ratio was 1.51, which indicates a positive net return to the farmers of the study area.

**Airee et al.** (2020) found that the average benefit-cost (B:C) ratio of paddy farmers was 1.40 in their study of supply chain analysis of the rice sub-sector in Kanchanpur district of Nepal.

**Sharma et al.** (2020) in his study of factor productivity of rice production in India showed that human and machine labour accounted for the majority of variable expenses in almost all states. The percentage share of the land cost ranged from 20% to 55%. The land cost included the rental value of owned land; miscellaneous; rent paid for land lease, land revenue, and taxes. Land expenses accounted for the most (32.41%) in Andhra Pradesh, followed by human labour (32.41%), machine labour (15.41%), fertilizer (9.63%), insecticide (3.35%), and seed (2.53%). The percentage of animal labour expenses was found to be decreasing (-0.75%). In the state of Assam when compared to other inputs, human labour expenses contributed the most (41.73%), followed by animal labour (16.96%), land (16.68%), machine labour (9.00%), fertilizer (1.66%), seed (1.55%), manure (1.38%), irrigation (1.32%), and insecticide (1.32%). (0.08%). Similarly, human labour expenses accounted for the highest percentage (37.90%) in Bihar, followed by land (25.57%), machine labour (10.53%), irrigation charges (8.79%), fertilizer (6.71%), seed (3.64%), and manure (0.82%) and pesticide (0.82%). (0.09%).

**Subedi et al.** (2020) mentioned that NRs of 50901/ha was the overall cost of rice production in Jhapa district of Nepal. Human labour cost accounted for 63.44% of total cost, followed by chemical fertilizer (13.41%), tractor power (12.70%), seed (8.44%), and irrigation cumulative pesticides/herbicides (2.01%). The average total returns from rice production per ha were calculated as NRs.1,04,432/ha. Grains accounted for 90% of total returns, while straw accounted for 10%. The gross margin of rice production was calculated to be NRs. 53531/ha. The benefit-to-cost ratio was calculated to be 2.05, demonstrating that rice farming in the studied area was profitable.

**Paudel et al.** (2021) in their study of the economics of rice production under the rice zone in Gorkha district, Nepal, reveals that in comparison to other inputs, labour costs accounted for 75% of the total cost of rice production. According to (Sapkota & Sapkota (2019), labour costs had the highest contribution to the cost of rice production. Rice grains and straw contributed 79.5 % and 20.50%, respectively, to the return on the rice. The BC ratio, on an average, was found to be 1.28, demonstrating that rice farming in the studied area was profitable.

**Yadav et al.** (2021) mentioned in their study that human labour was the most important input, along with seed, tillage, FYM, chemical fertiliser, pesticides, and irrigation. The productivity (t/ha) and production (kg) per household were 3.64 t/ha and 4458.965 kg, respectively. The estimated total average cost and gross revenue per hectare were NPR.108214.79 and NPR.120227.04 respectively. The benefit cost ratio was 1.11 on average.

## **2. To study the major input constraints faced/perceived by paddy growing farmers in the study area**

**Bhujel & Ghimire** (2006) carried out their study "Estimation of production function of Hiunde (Boro) rice". In their study, some farmers expressed concerns about the availability and quality of chemical fertilizers and fuels, as well as the erratic supply of electricity and the damage to electric poles and pillars caused by storms that were not promptly repaired by the appropriate organizations. They wanted the government to support the installation of irrigation facilities through a subsidy programme because it was a high-water-use crop that required more irrigation than

any other. Farmers in the survey area expressed greater worry about the quality of inputs.

**Cong Thanh & Singh** (2006) conducted their studies in India's Punjab and West Bengal states, as well as Vietnam's A Giang and Vinh Long province. Farmer's Agro-ecological constraints, graded from most to least severe, were found to be connected to monsoon, land/soil issues, pollution, lack of water, and limited land holdings. Diseases (sheath blight, blast, and stem rot); pests; a lack of appropriate varieties; post-harvest technology constraints; and storage issues was the most important technical obstacles. Other constraints identified by farmers include fertilizer issues, plant protection constraints, weed issues, a lack of labour, and poor processing. Poor infrastructure, high input costs, credit problems, low rice prices, inadequate inputs, and a lack of training were identified as the most significant socio-economic restrictions by a substantial number of farmers, according to the survey. Poor extension services, a lack of information, and a lack of helpfulness from local authorities or governments were among the other obstacles identified by a smaller percentage of farmers.

**Kumar & K** (2008) used Henry Garreth's ranking technique to rank the constraints faced in contract and non-contract farming.

**Kherwa** (2009) in the study of profitability analysis and resource use efficiency of wheat, it was shown that the lack of subsidized inputs was the primary barrier for farmers in profitability analysis and resource usage efficiency. According to the respondents, the second and third constraints were a lack of funds and a lack of access to loans. The fourth and fifth constraints were a lack of the appropriate dose of inputs and a lack of understanding about the recommended practices, respectively.

**Kumbhare & Singh** (2011) in their study revealed that the respondent's main constraints in paddy were the lack of a rubber milling plant in their area for rice processing, which was a key constraint in paddy (66.66 %). Breakage of grains during milling/processing (61.66 %), lack of transportation facilities (58.33 %), low market price and poor cooking quality due to grain breakage (43.33 %), and lack of market facilities were the next three factors (41.66 %).

**Taylor et al.** (2012) studied constraints faced by Tribal farmers in Dairy farming in Udaipur district by using the Henry constraint ranking technique.

**Churpal et al.** (2015) mentioned that there are input constraints in his study. In terms of input availability, labour availability was the main constraint in rice cultivation, as reported by 48% of farmers, followed by fertilizer (47%) and seed availability (46%). Similarly, 45% and 30% farmers said that farm yard manure and irrigation were not available on time.

**Ravikumar** (2016) mentioned that he used Henry Garrett's ranking technique to determine the most important factor impacting the adoption of precision farming by the sample farmers. This technique was used in his study of analyzing the factors influencing the decision to adopt precision farming methods in Tamil Nadu.

**Jagadeesh** (2017) in the study of the economics of production and marketing of turmeric, Garrett's ranking was used to quantify the challenges that the sample farmers had with turmeric cultivation.

**Muzaffar et al.** (2017) conducted their study in the Budgam district of Kashmir to assess the barriers in adopting recommended agricultural practices in paddy cultivation, which aids in providing feedback to programme stakeholders for programme improvement. Lack of skill in seed treatment (98.88%), lack of technical advice for seed storage (93.33%), irregular visits by Agricultural Officers (94.44%), low rate of paddy in the local market (84.44%), high cost of fertilizers (82.22%), high rate of seeds (72.73%), and an insufficient and untimely supply of loans (80%) were the barriers in adopting recommended agricultural practices.

**Singh et al.** (2017) showed that in terms of numerous constraints, technical problems came first, followed by managerial problems, Agro-climatic problems, and other problems. Large farms have the most technical issues (54.35%), followed by medium farms (54.34%), small farms (46.15%), and marginal farms (45.2 %). Seed, plant protection, and weed control were among the issues, as were harvesting, threshing, irrigation, and other issues. The highest marginal farms (34.57%) have management problems, followed by small farms (28.85%), medium farmers

(27.18%), and large farmers (21.74%). Management problems indicate a negative trend with farm size. Small farmers (18.59%) had the highest intensity of difficulty, followed by large farmers (17.39%), marginal farmers (13.83%), and small farmers (13.04%) in terms of Agro-climatic constraints. Large farmers (6.52%) had the most miscellaneous problems, followed by small farmers (6.41%), marginal farmers (6.38%), and medium farmers (5.43%).

**Balamurugan et al.** (2018) mentioned that they used Garrett's ranking technique to rank the factors that influenced the particular type of rice cultivation by the farmers. The results of Garrett's ranking technique revealed that the most significant constraints in rice cultivation using canal, tank, and well irrigation systems were a lack of fertilizers at the appropriate time, a delay in receiving subsidies for drip irrigation and fertigation systems, and a scarcity of irrigation water.

**Basyal et al.** (2019) in their study of "Constraints of Paddy Production in Western Terai of Nepal" they divided constraints of paddy production into four different categories, i.e., Agro-ecological, economic, technical, and institutional. Late onset of rainfall was ranked 1 among Agro-ecological restrictions, followed by soil problems (poor soil fertility), change in rainfall pattern, and early cessation of rainfall. Under economic constraints, high chemical fertilizers costs were ranked first by 85% of respondents, followed by lack of chemical fertilizers availability in the market, high farm equipment costs (perceived by 80.83%), high cost of improved seed costs (perceived by 79.17%), high labour wages, unavailability of decomposed FYM, high pesticide costs, improper land distribution, high water costs, and high electricity charges. Under technical constraints, the lack of improved varieties was ranked first by 88.33% of respondents, followed by the unavailability of high-quality pesticides/insecticides by 54.16%, a proper irrigation system, modern farm machinery, agricultural laborer shortages, and heavy pest and weed infestations by 54.16%. Similarly, poor market infrastructure and lack of training are the top two institutional constraints, according to 60% of respondents, followed by a lack of extension services in the study area, lack of proper crop insurance, lack of access to market information, lack of sufficient fuel and electricity for irrigation and farm mechanization and lack of credit.

**Ray et al.** (2019) mentioned in their study that they used Garrett's ranking technique for constraint analysis in the production and marketing of Katarani rice in Bihar. Agro-biological constraints included low rainfall (Garrett Score = 65.48), poor soil condition, and pest infestation. Whereas technological constraints included a lack of improved katarni rice seeds (Garrett score = 54.27), followed by poor seed quality. Another aspect of technological constraint was the lack of fertilizers in the market at the right time. On the basis of Garrett scores of 55.70, 53.80, and 40.50, it was discovered that irrigation was the major economic constraint faced by sample farmers in the production of katarni rice, followed by its availability and charges.

**Hiremath** (2021) conducted the study "Issues in Adoption of Drip and Conventional Irrigation Methods in Banana: A Socio-Economic Analysis of the South Gujarat Region". He used Garrett's ranking technique to rank the constraints. With a Garrett score of 81.59, 74.15, and 68.19, the top three significant challenges faced by farmers were recognized as high initial capital investment, blockage of emitters owing to water salinity and frequent system degradation due to mice, pigs, and other animals. Farmers who use traditional irrigation methods believe that water wastage in the form of excessive irrigation is the most serious concern, with a Garrett score of 80.21, followed by high electricity usage (73.68) and water logging is an issue (67.03).

**Paudel et al.** (2021) carried out a study titled "Economics of rice production under the rice zone in Gorkha District, Nepal". In their study, it was found that insect pests and diseases were found to be the most serious difficulties in rice production in the research area, followed by a lack of quality seeds, fertilizers and pesticides, irrigation, and extension services.

**Sapkota et al.** (2021), showed in their study that the lack of a proper organic market (0.68), the high cost of organic seed and fertiliser (0.56), lack of knowledge and training on organic farming (0.48), and lack of government support such as grants and premium prices (0.44) are the second, third, fourth, and fifth major hindrances in the adoption of organic rice farming, respectively.

**Singh et al.** (2021) conducted their study in the Sultanpur district of Uttar Pradesh. Garrett's ranking technique was used to analyse the respondent's perception of constraints in hybrid rice farming.

**Upadhyay et al.** (2021) in their study used Henry Garreett's ranking method for constraints analysis in hybrid rice farming. The most important constraint, as perceived by respondents, was seed that could not be used again in sowing, which ranked first with a Garrett Mean Score of 74.58, followed by higher seed costs, which ranked second with a Garrett Mean Score of 65.74. With a garret mean score of 63.9, distasteful cooking quality was ranked third. Other constraints included less head rice recovery, a falling problem with large varieties, a lack of pricing ability and demand, a problem with hybrid rice ripening time, a lack of knowledge about seed treatment, and cheap grain quality, which were ranked fourth, fifth, sixth, seventh, eighth, and ninth with garret mean scores of 55.58, 54.92, 49.68, 48.70, 41.66, and 41.16, respectively.

**Balla & Goswami** (2022) studied constraints and reasons to adopt natural farming. In this study, they used Henry Garreett's ranking technique. In terms of ranks and Garrett mean score, this technique prioritized the reasons and constraints for using natural farming. Higher labour costs, a lack of experience in any of the agroecological techniques, low fertile soils, and a higher incidence of pests and diseases have been identified as critical constraints to adopting natural farming.



## **RESEARCH METHODOLOGY**

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Any type of investigation with specific goals invariably necessitates the use of scientific methods and procedures. The reliability and validity of estimates are determined by the data collection methods and procedures, as well as the analytical tools used in the study. This chapter makes an attempt to provide the methodology used for data collection and analysis in order to reach useful conclusions.

The Research Methodology adopted has been described in the following sub-headings.

3.1 Study Area

3.2 Sampling Procedure and Data Collection

3.3 Data Analysis

3.4 Cost concept

3.5 Measurement of different cost element

3.6 Constraint Analysis using Henry Garrett's Ranking Technique

### **3.1 Study Area**

Amongst the various cereal producing districts of Nepal, Kapilvastu is a major rice producing district of Nepal. According to the data, Kapilvastu ranks as the third major rice producing district (2019/20) of Nepal (MoALD, 2021). Therefore, this district was selected for the present study. Out of nine municipalities of the district, Banganga Municipality was purposefully selected for the present study because it is a major rice producing zone and in 2018/19 it was recognized as rice super zone by PM-AMP, MoALD. Within this municipality ward 5 and 6 were the study area.

### **3.2 Sampling Procedure and Data Collection**

The simple random sampling method was used to select the rice growing farmers of the study area and a total of 46 respondents were selected for the present study. A pre-tested interview schedule was used to collect the primary data and also, relevant literatures, internet, various reports of the Nepalese Government were reviewed for the secondary data collection.

### **3.3 Data Analysis**

The interview schedule was administered in February in 2022 and raw data were collected for the study. For the analysis, the local measurements were converted into the standard unit and then analysis was carried out using Microsoft excel. The result was derived using descriptive statistics.

The objective like socioeconomic characteristics was worked out by using pie-chart and simple tabular analysis. The cost of paddy production was calculated using CACP's standardized cost concept, i.e., cost-A1 A2 B1B2 C1 C2 and C3, benefit-cost ratio, and tabulated for interpretation.

### **3.4 Cost concepts used**

**3.4.1 Cost A1:** It includes all actual expenses in cash and kind incurred in production by the producer. The following items are included in cost A1.

- i. Value of hired human labour;
- ii. Value of hired and owned bullock labour;
- iii. Value of owned and purchased seed;
- iv. Value of fertilizers, manures, and chemicals;
- v. Value of hired and owned machinery charges;
- vi. Value of insecticide and taxes;

- vii. Land revenue and taxes;
- viii. Expenditure on irrigation;
- ix. Interest paid on crop loan if taken;
- x. Depreciation on farm assets excluding land;
- xi. Interest in working capital;
- xii. Miscellaneous expenses.

**3.4.2 Cost A2:** It includes:

Cost A1 + rent paid for leased-in land.

**3.4.3 Cost B1:** It includes:

Cost A2 + interest on the value of owned fixed capital excluding land.

**3.4.4 Cost B2:** It includes:

Cost B1 + rental value of owned land.

**3.4.5 Cost C1:** It includes:

Cost B1 + imputed value of family labour.

**3.4.6 Cost C2:** It includes:

Cost B2 + imputed value of family labour.

**3.4.7 Cost C3:** It includes:

Cost C2 + 10 % of Cost C2 to account for the managerial cost of inputs of farmer.

### **3.5 Measurement of different cost element**

#### **3.5.1 Gross and net return**

##### **3.5.1.1 Gross return**

Gross return was calculated by adding return from grain and straw. The calculation was done based on the local market value of grain and straw.

Gross return = Grain return+ Straw return

Grain return = Total grain produced (quintal)\*price per quintal

Straw return = Total straw produced (tractor)\*price per tractor

Similar method was used by Sapkota & Sapkota (2019)

##### **3.5.1.2 Net return**

Net returns were computed at different costs i.e., Cost A, Cost B and Cost C by deducting respective cost from the gross returns.

Net income at A1 = Gross returns - Cost 'A1'

Net income at A2 = Gross returns - Cost 'A2'

Net income at B1 = Gross returns - Cost 'B1'

Net income at B2 = Gross returns - Cost 'B2'

Net income at C1 = Gross returns - Cost 'C1'

Net income at C2 = Gross returns - Cost 'C2'

Net income at C3 = Gross returns - Cost 'C3'

### **Benefit Cost Analysis (B:C) Analysis**

$$\text{Benefit Cost Ratio at cost 'A1'} = \frac{\text{Gross return}}{\text{Cost 'A1'}}$$

$$\text{Benefit Cost Ratio at cost 'A2'} = \frac{\text{Gross return}}{\text{Cost 'A2'}}$$

$$\text{Benefit Cost Ratio at cost 'B1'} = \frac{\text{Gross return}}{\text{Cost 'B1'}}$$

$$\text{Benefit Cost Ratio at cost 'B2'} = \frac{\text{Gross return}}{\text{Cost 'B2'}}$$

$$\text{Benefit Cost Ratio at cost 'C1'} = \frac{\text{Gross return}}{\text{Cost 'C1'}}$$

$$\text{Benefit Cost Ratio at cost 'C2'} = \frac{\text{Gross return}}{\text{Cost 'C2'}}$$

$$\text{Benefit Cost Ratio at cost 'C3'} = \frac{\text{Gross return}}{\text{Cost 'C3'}}$$

### **3.6 Constraint Analysis using Henry Garrett's Ranking Technique**

This technique was used to evaluate the constraints faced by the farmers. The formula was used to convert the respondent's orders of merit into rank. Garrett's ranking technique was used to determine the most significant constraint influencing the farmer. According to this method, respondents were asked to rank all constraints, and the results of such ranking were converted into score value using the following formula:

$$\text{Percent position} = \frac{100(R_{ij} - 0.5)}{N_j}$$

Where,

$R_{ij}$  – Rank given for the  $i$ th variable by the  $j$ th respondents

$N_j$  – Number of variables ranked by  $j$ th respondent

The estimated percent position was converted into scores using Garrett's Table. The scores of each individual were then added for each constraint, and the total value of scores and average values of scores were calculated. The factor with the highest average value was deemed to be the most important. Similar analysis was done by Singh *et al.* (2021)



## PROFILE OF THE STUDY AREA

Kapilavastu is one of the districts of Lumbini Province, Nepal. Kapilavastu municipality is the headquarter of this district. The district has an area of 1738 km<sup>2</sup> and is situated at a height of 93 to 1,491 meters (305 to 4,892 ft) above sea level. Geographically, the district can be divided into the low land plains of Terai and the low Chure hills. Kapilavastu is bounded by Rupandehi District to the east, Dang Deukhuri District in Rapti zone to the northwest, Arghakhanchi District to the north, Balrampur district, Awadh region of Uttar Pradesh, India to the west and Siddharthnagar district of Purvanchal region, Uttar Pradesh to the south.

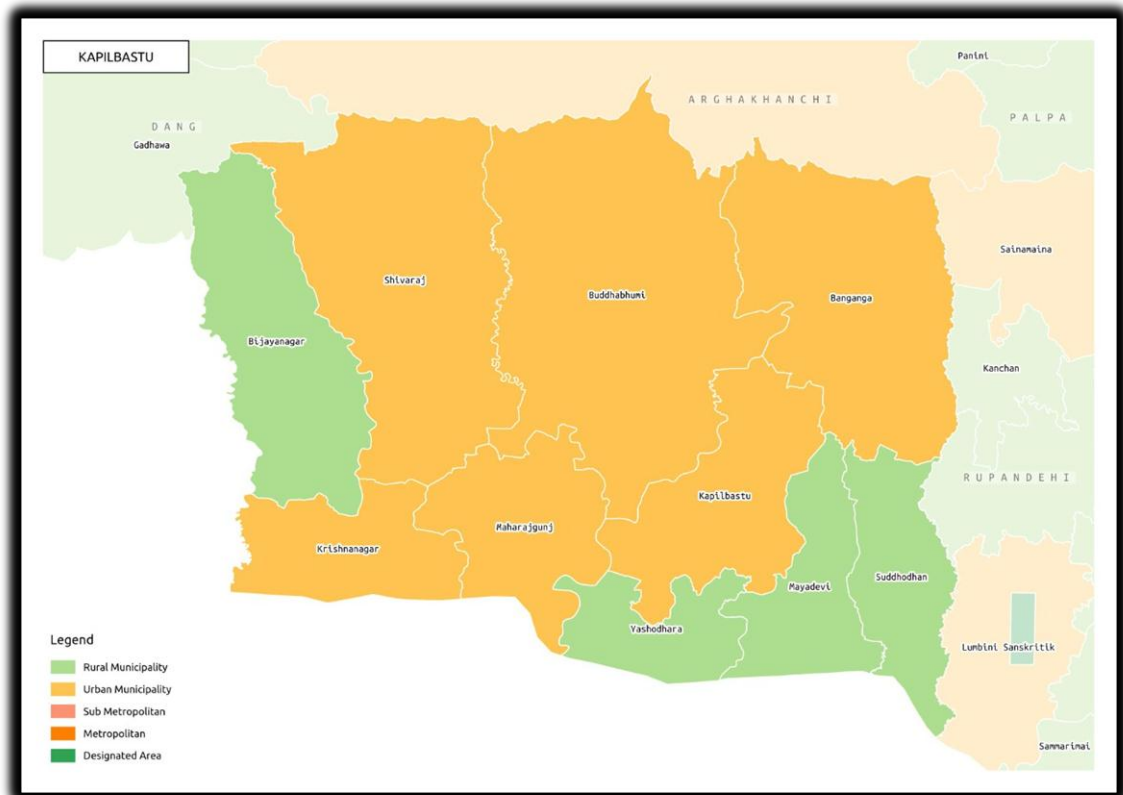


Fig 4.1: Map of Kapilavastu district

**Table 4.1: Basic details of Kapilvastu district**

1.	Population	686,739
	Male	285,599
	Female	286,337
2.	Language	
	Awadhi	67.6%
	Nepali	17.1%
	Tharu	11.3%
	Magar	1.7%
	Maithili	0.9%
3.	Population density	395.1/km <sup>2</sup>
4.	Annual population change	1.8%
5.	Forest area	63438.42 ha

Source: Central Bureau of Statistics Nepal (2021)

#### **4.1 General characteristics of Kapilvastu district**

The district consists of ten municipalities, out of which six are urban municipalities and four are rural municipalities. These are as follows:

- Kapilvastu Municipality
- Banganga Municipality
- Buddhabhumi Municipality
- Shivaraj Municipality
- Krishnanagar Municipality
- Maharajgunj Municipality

- Mayadevi Rural Municipality
- Yashodhara Rural Municipality
- Suddhodhan Rural Municipality
- Bijaynagar Rural Municipality

#### **4.2 Economy**

Most of the population of the district is dependent on agriculture. Paddy rice is a major crop of the district. A number of youths rely on foreign employment while sugarcane is an important cash crop.

**Table 4.2: Economy of Kapilvastu district**

<b>Crop</b>	<b>Production in metric tonnes</b>
Paddy	>150,000
Wheat	25,000-35,000
Sugarcane	>175,000
Oil seed	1,000-5,000

#### **4.3 Climate**

Kapilvastu district has following climatic zones.

<b>Climate zone</b>	<b>Elevation range</b>	<b>% of area</b>
Lower tropical	Below 300 meters (1,000 ft)	86.8%
Upper tropical	300 to 1,000 meters 1,000 to 3,300 ft.	12%
Sub-tropical	1,000 to 2,000 meters 3,300 to 6,600 ft.	1.2%

#### **4.4 Culture**

Awadhi people are the major inhabitants of this region, which is very rich in their culture. Awadhi cuisine is well known. Most people of the district follow Sanatana culture and majority of the population is Hindu. Therefore, festivals such as Vijaya Dashami, Deepawali, Holi, Ram Navami and Naag Panchami are very popular. Shivaratri and the month of Shrawana attract huge crowds in the district capital Taulihawa where ancient Tauleshwar Nath Temple exists. Since Kapilvastu was the kingdom of Bhagwan Buddha, Vaishak Purnima is also celebrated in a grand way. The local population including Tharu celebrates Makar Sankranti (Maghi) with festivity. Tharus live in the northern part of the district.

#### **4.5 Archaeological sites**

More than 138 historical sites related to Buddha have already been identified within the boundary to the east of Banganga, west of Kothi, north to Indian border and south to Mahendra highway. The forest of the district stands as a natural park. The land is irrigated by the rivers like Banganga, Koili, Surai, Chirai, Bhutera and others. The latest archaeological excavation carried out under the aegis of the Department of Archaeology (DoA) has discovered that Kapilvastu has the highest number of archaeological sites in the country. The department has identified 136 archaeological sites in the district.



## **RESULTS AND DISCUSSION**

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The findings from the study are described objective wise. The following sub-headings contain the parts of result and discussion.

- 5.1 Socio-economic profile of the sample households
- 5.2 Estimation of cost and return from the cultivation of paddy crop
- 5.3 Major input constraints faced/perceived by paddy growing farmers

### **5.1 Socio-economic profile of the sample households**

The socio-economic characteristics of the farmer influence their farm's production and income activities. The major socio-economic factors that have been studied in the present research for paddy cultivation are age, gender, educational status, family size, farming experience, occupation, land utilization pattern, and cropping pattern.

#### **5.1.1 Strength of the family**

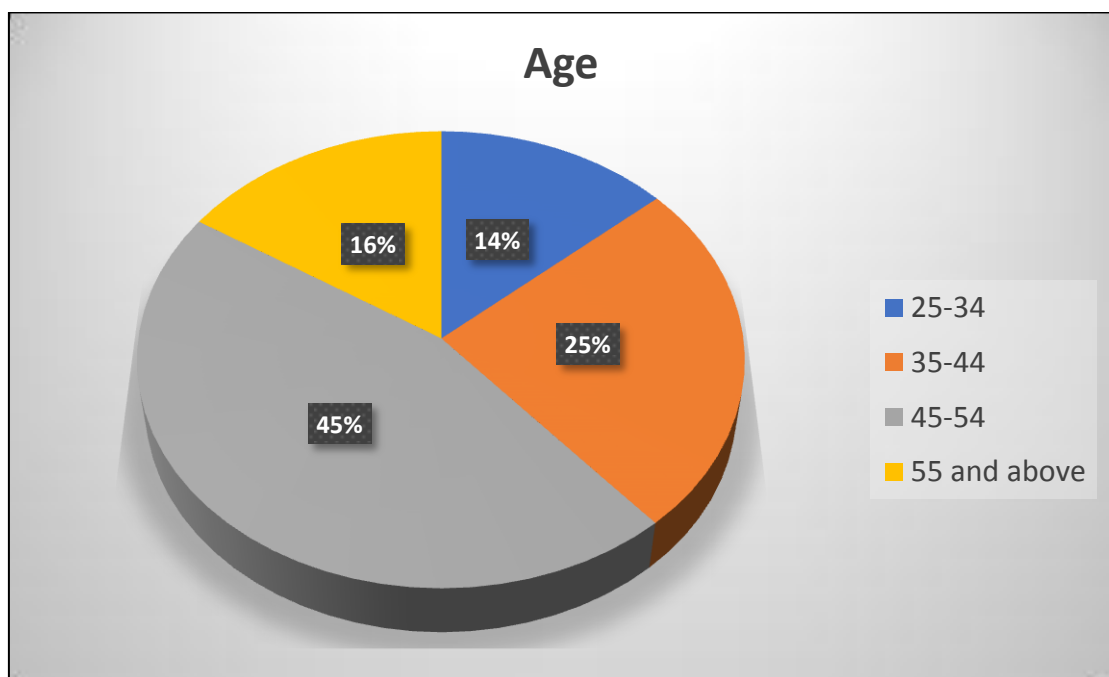
Table-5.1 shows the family composition and average strength of the sample farm family. This table shows that males (18–50 years of age) dominated in family strength, with an average of 1.84 males per family, followed by children under 18 years (1.40), females (1.77), females over 50 years (0.38), and males over 50 years (0.20). The average family strength was found to be (5.61) people per family.

**Table 5.1: Average strength of sample households**

S.No.	Particulars	Number	Average strength of sample family	Percentage
1	Children below 18 years	62	1.40	25.10%
2	Male (18-50 years)	81	1.84	32.79%
3	Female (18-50 years)	78	1.77	31.58%
4	Male above 50 years	9	0.20	3.64%
5	Female above 50 years	17	0.38	6.88%
Total		247	5.61	100%

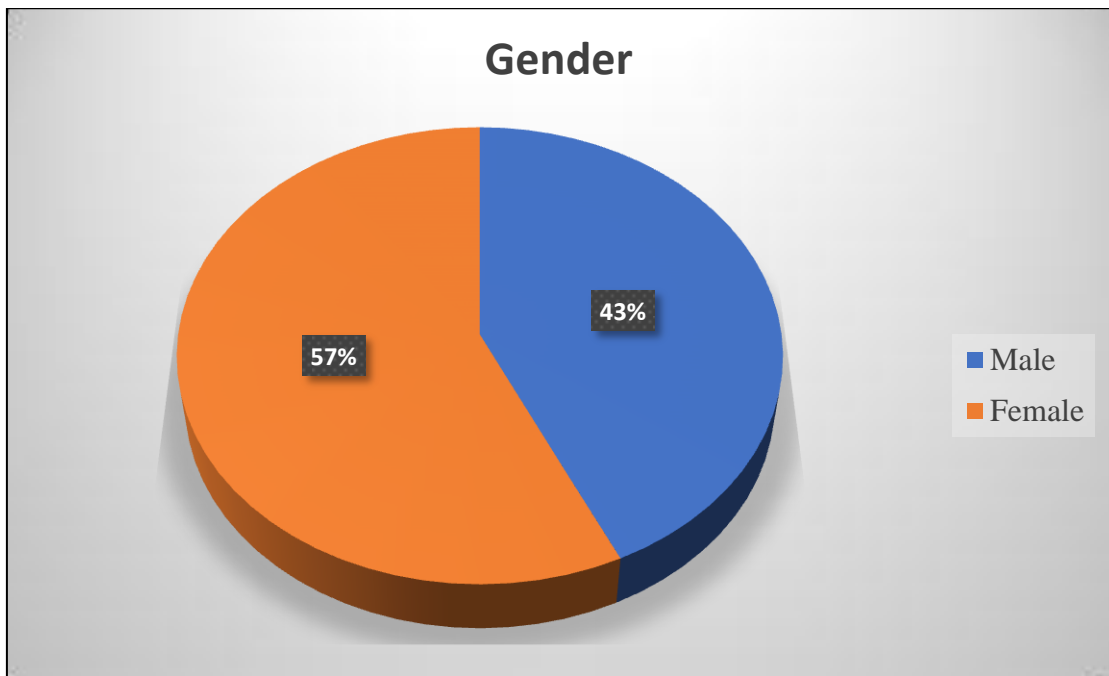
**5.1.2 Age and Gender**

The farmer, as the supreme of the family, makes the majority of farm business decisions regarding input use, cropping pattern, and other farm managerial decisions. As a result, it is necessary to have an idea about the age of the respondents.



**Fig. 5.1: Age distribution of the respondent**

The respondents were categorised into 4 age groups (Fig-5.1). The majority of respondents (45%) were between the ages of 45 and 54 years. Similarly, 25% were between the ages of 35 and 44 years, with the elderly (55 and older) coming in third (16 percent ). Finally, only 14% were between the ages of 25 and 34 years.



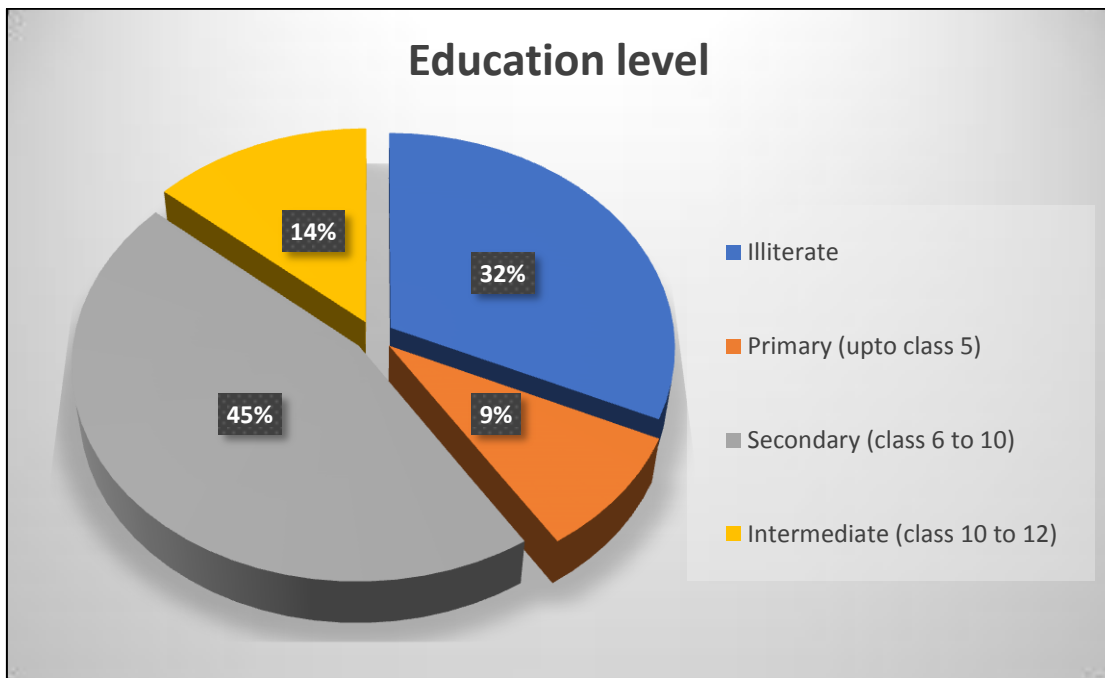
**Fig. 5.2: Gender of the respondent**

The data revealed that the majority of respondents (57%) were female, with the remainder (43%) being male (Fig-5.2). It indicates that females are more engaged in farming activities than males. There could be few reasons for this. The first is that the majority of the male members of the family are away on business. The second reason is that the few males who remain in their home country are also involved in some service or business, and thus do not have time to engage in agricultural activities.

### **5.1.3 Education level**

Education is also an important factor that influences the farming community to adopt and practice new ideas and apply new tools and technologies which is very

important for the increase in farm production and household income. The data below shows that education status of the respondents.

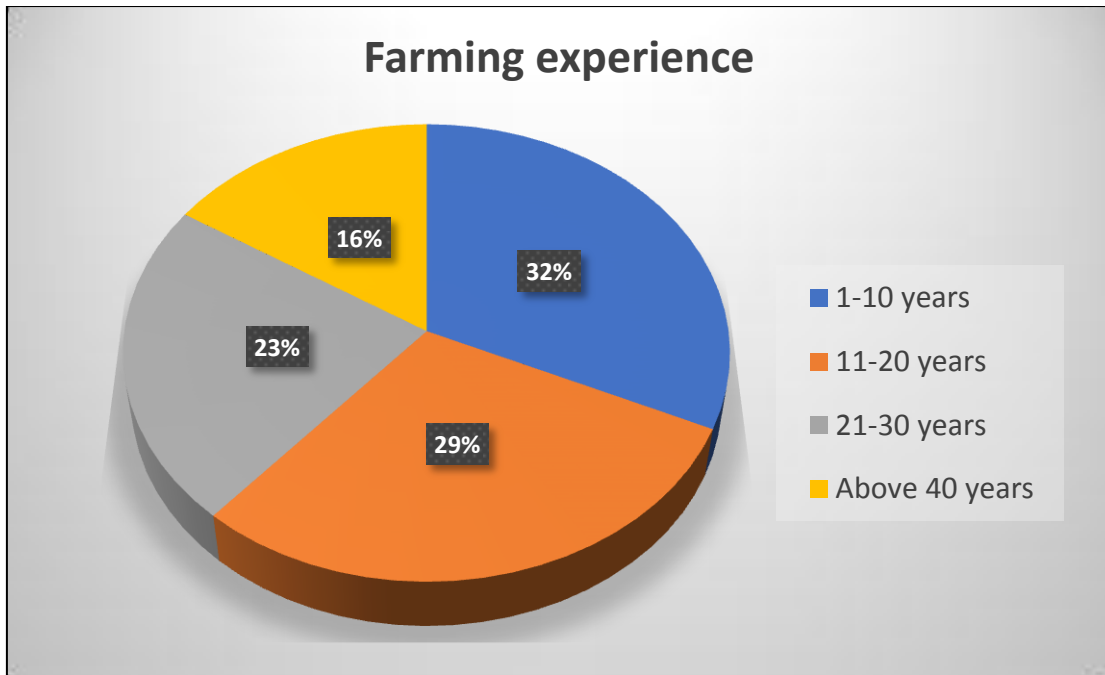


**Fig. 5.3: Education status of the respondent**

As observed from Figure-5.3, the respondent's highest level of education is only intermediate. It is also worth noting that the majority of respondents (32%) were illiterate. Only 68% of respondents have received formal education, with 45% having received only secondary education, 14% having received intermediate education, and the remaining 9% having studied only till primary school.

#### **5.1.4 Farming experience**

Farmer's farming experience informs them about better farming practices. It also assists them in making necessary farm decisions, such as crop variety, inputs, input doses, and so on.

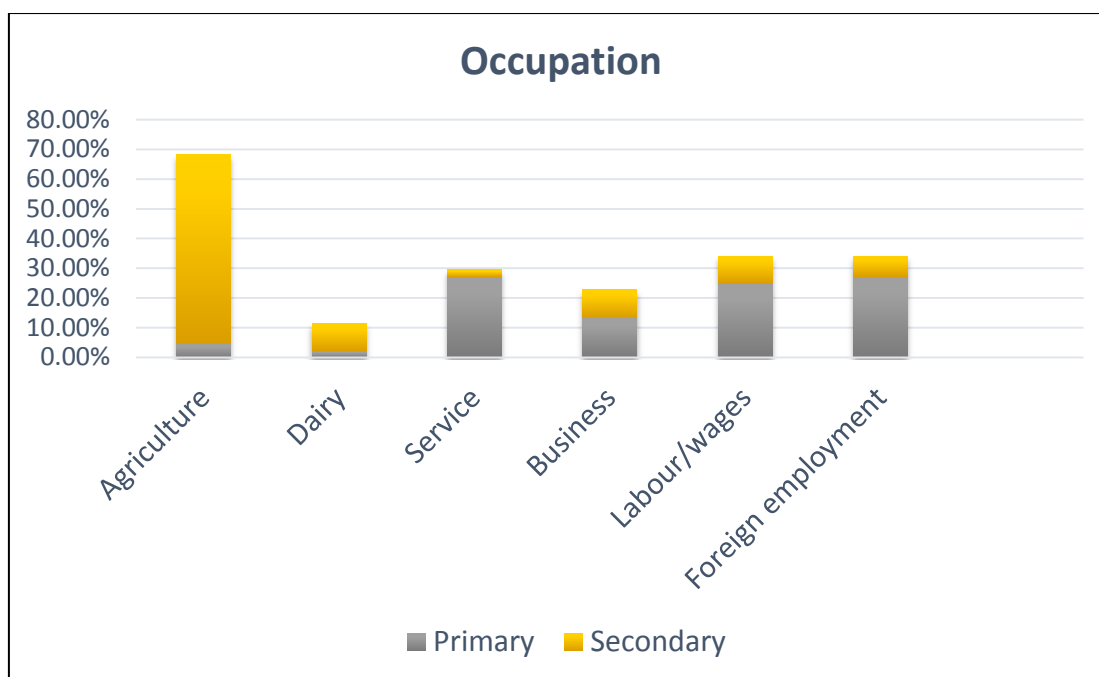


**Fig. 5.4: Farming experience of the respondents**

The data on farming experience from Figure-5.4 clearly indicates that the majority of respondents (32%) have less than 10 years of farming experience, followed by 29% who have farming experience ranging from 11 to 20 years. Similarly, 23% of respondents have 21 to 30 years of farming experience, and 16% have more than 40 years of farming experience. These findings revealed two things: those with less than ten years of farming experience have either just begun farming or have recently taken on the responsibility of managing the farm because other elders in the house previously managed it.

### **5.1.5 Occupation**

The respondent's occupation is directly related to agricultural production and income. Those respondents whose primary occupation is agriculture give more priority to increasing farm production and farm income, while those respondents whose primary occupation is other than agriculture give less priority to farm production and farm income.



**Fig. 5.5: Primary and secondary occupation of the respondents**

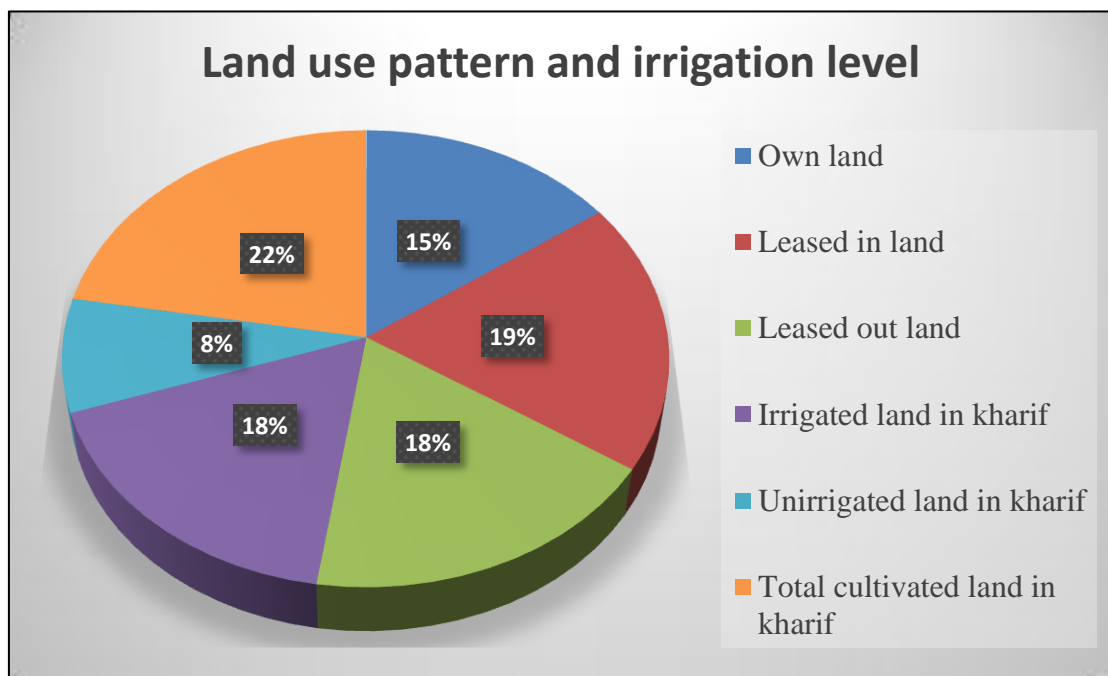
As per Figure-5.5, the majority of respondents work in service (nearly 30%), foreign employment (nearly 30%), and labour/wages (about 25%), followed by business (nearly 15%), agriculture (nearly 3%), and dairy (nearly 2%). In the study, it was found that the agriculture as a primary occupation of the respondents is decreasing over time. It may be due to the reason that the majority of people make their living through service, foreign employment, labour/wages, and businesses etc. The second factor could be that the people are less willing to engage in agricultural activities because of low production and productivity, high cost of cultivation and a lack of manpower to support farm operations.

#### **5.1.6 Land use pattern and irrigation level on sample household**

According to the land use pattern analysis, the average land holding size was found to be 0.46 ha. The average size of the land taken on lease was 0.58 ha, while the leased-out land was 0.54 ha. Similarly, the average irrigated and unirrigated land area in kharif was 0.53 ha and 0.24 ha, respectively. The average cultivated area by the respondents in kharif season was 0.67 ha.

**Table 5.2: Land use pattern and irrigation level on sample household**

Particulars	Average area (in ha)	Percentage
Own land	0.46	29.11%
Leased in land	0.58	36.70%
Leased out land	0.54	34.17%
Irrigated land in Kharif	0.53	33.54%
Unirrigated land in Kharif	0.24	15.18%
Total cultivated area in Kharif	0.67	42.40%
Total	1.58	



**Fig. 5.6: Land use pattern and irrigation level on sample household**

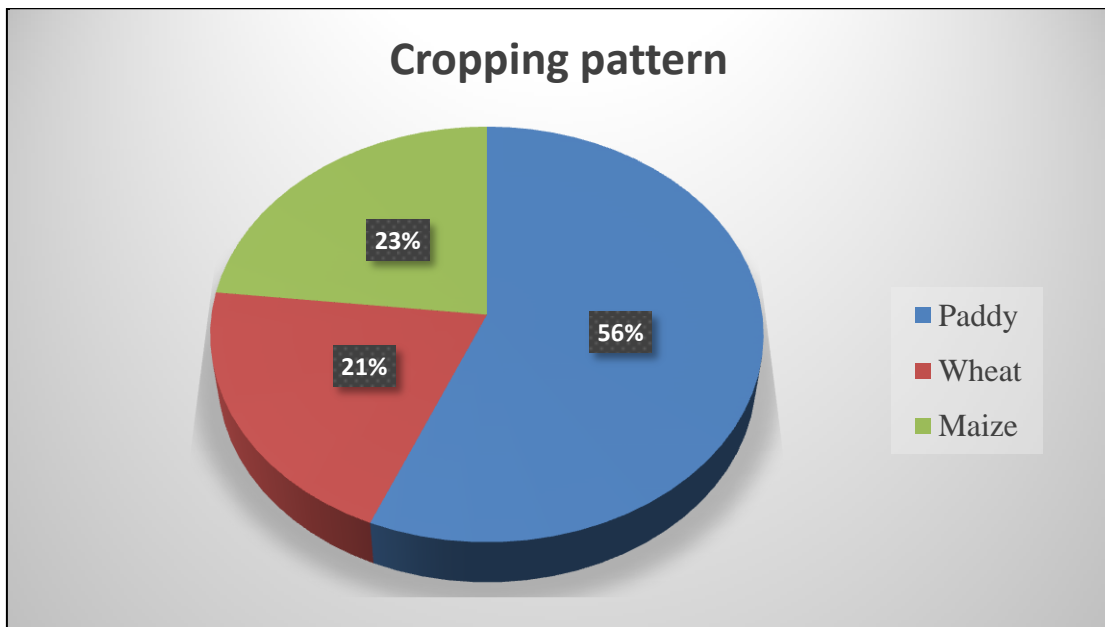
## 5.1.7 Cropping pattern

Table 5.3: Cropping pattern in sample households

Name of the crop	Crop variety	Average Area (in ha)	Percentage
Kharif crop			
a. Paddy	Sawa mansuli	0.55	11.96%
	Gorakhnath	0.33	7.17%
	Radha-4	0.86	18.70%
	Ramdhan	0.36	7.84%
	Sabitri	0.47	10.22%
Total Kharif crop		2.59	56.30%
Rabi crop			
a. Wheat	Local	0.21	4.56%
	Improved	0.02	0.43%
	Hybrid	0.71	15.43%
Total wheat crop		0.94	
b. Mustard	Local	0.23	5%
	Improved	0.13	2.81%
	Hybrid	0.71	15.44%
Total Mustard crop		1.07	
Total Rabi crop		2.01	43.70%
<b>Gross cropped area</b>		<b>4.6</b>	<b>100%</b>
<b>Cropping intensity (%)</b>		<b>291.13%</b>	

The analysis of cropping pattern data revealed that kharif crops dominated in the study area, accounting for 56.30 percent of the total gross cropped area. Rabi crops accounted for only 43.70 percent of total gross cropped area. Radha-4 is the most common paddy crop variety, accounting for 18.70% of the total gross cropped area, followed by Sawa mansuli (11.96%), Sabitri (10.22%), Ramdhan (7.84%), and Gorakhnath (7.17%). Similarly, mustard was the dominant crop among Rabi crops.

This crop accounted for 23.27% of total gross cropped area. The second most important factor was wheat, which accounted for 20.42% of total gross cropped area. The cropping intensity was found to be 291.13% which indicates that around 3 crops were being cultivated by the respondents on their farm.



**Fig. 5.7: Cropping pattern in sample households**

## **5.2 Estimation of cost and return from the cultivation of paddy crop**

The estimation of the cost and return of paddy cultivation is important to choose the best alternative resources, cultivation practices, and scale of production. Secondly, it estimates how much money farmers will need to cultivate paddy based on the size of the crop area and the level of technological adoption. It is a well-known fact that the returns of crop production depend upon the cost of production, yield per unit of area, and their relative prices.

### **5.2.1 Cost of cultivation of paddy**

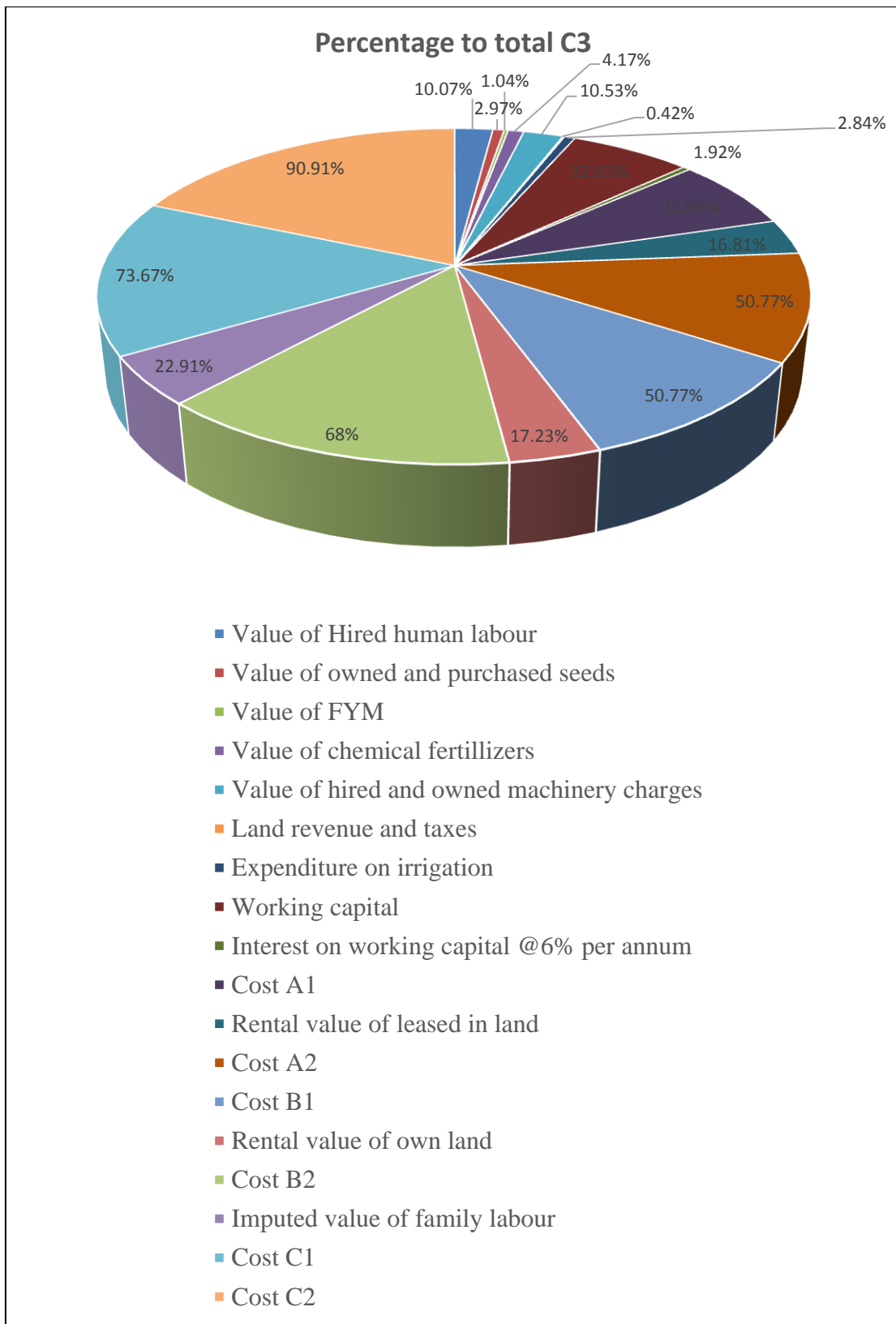
The cost of cultivation of paddy per hectare was calculated using the CACP concept. All input costs were estimated, and the average cost was used to calculate the cost of cultivation (Table- 5.4).

**Table 5.4: Per hectare cost of cultivation of paddy crop in sample households**

(NRs/ha)

<b>S.No</b>	<b>Cost particulars</b>	<b>Total cost</b>	<b>Percentage to total cost C3</b>
1.	Hired human labour	14176.43	10.07%
2.	Imputed value of family labour	32250	22.91%
3.	Hired and owned machinery charges	14818.40	10.53%
4.	Owned and purchased seed	4176.62	2.97%
5.	FYM	1458	1.04%
6.	Chemical fertilizer	5875.41	4.17%
7.	Land revenue and taxes	591.8	0.42%
8.	Irrigation charges	4000	2.84%
9.	Working capital	45096.68	32.03%
10.	Interest on working capital	2705.80	1.92%
11.	Rental value of land leased in	23672	16.81%
12.	Rental value of own land	24263.8	17.23%
	<b>Cost-A1</b>	47802.48	33.95%
	<b>Cost-A2</b>	71474.48	50.77%
	<b>Cost-B1</b>	71474.48	50.77%
	<b>Cost-B2</b>	95738.28	68.00%
	<b>Cost-C1</b>	103724.48	73.67%
	<b>Cost-C2</b>	127988.28	90.91%
	<b>Cost-C3</b>	140787.10	100%
	Per quintal cost of paddy production at cost C3	3485.08	

Table-5.4 shows an estimate of the cost of paddy cultivation. Cost estimation helps in determining crop enterprise profitability. The cost of paddy cultivation per hectare was calculated using the CACP cost concept. The cost of cultivation (Cost C3) for paddy was found to be NRs 140787.10. The important percentage share to cost C3 was taken by the imputed value of family labour (22.91), followed by the rental value of own land (17.23), the rental value of land leased in (16.81), hired and owned machinery charges (10.53), hired human labour (10.07), chemical fertiliser (4.17), owned and purchased seed (2.97), irrigation charges (2.84), interest on working capital (1.92), FYM (1.04), land revenue and taxes (0.4) respectively. The costs A1, A2, B1, B2, C1 and C2 were NRs 47802.48, NRs 71474.48, NRs 71474.48, NRs 95738.28, NRs 103724.48 and NRs 127988.28 respectively. The table also revealed that the total yield of paddy per ha in the study area was 40.40 quintal. Similar kind of findings was found in the study of Sapkota & Sapkota (2019) where the yield of Gorakhnath variety of paddy is 42 q/ha in Kapilvastu district of Nepal. But according to the report of Ministry of Agriculture and Livestock Development (MoALD) (2021) the yield of paddy per ha was reported to be 3.51 t/ha for the year 2019/20 in the kapilvastu district. This shows that the production of paddy per ha is significantly higher than what it was reported by MoALD. Additionally, the table also shows that the per quintal cost of paddy production at cost C3 was NRs 3485.0882.



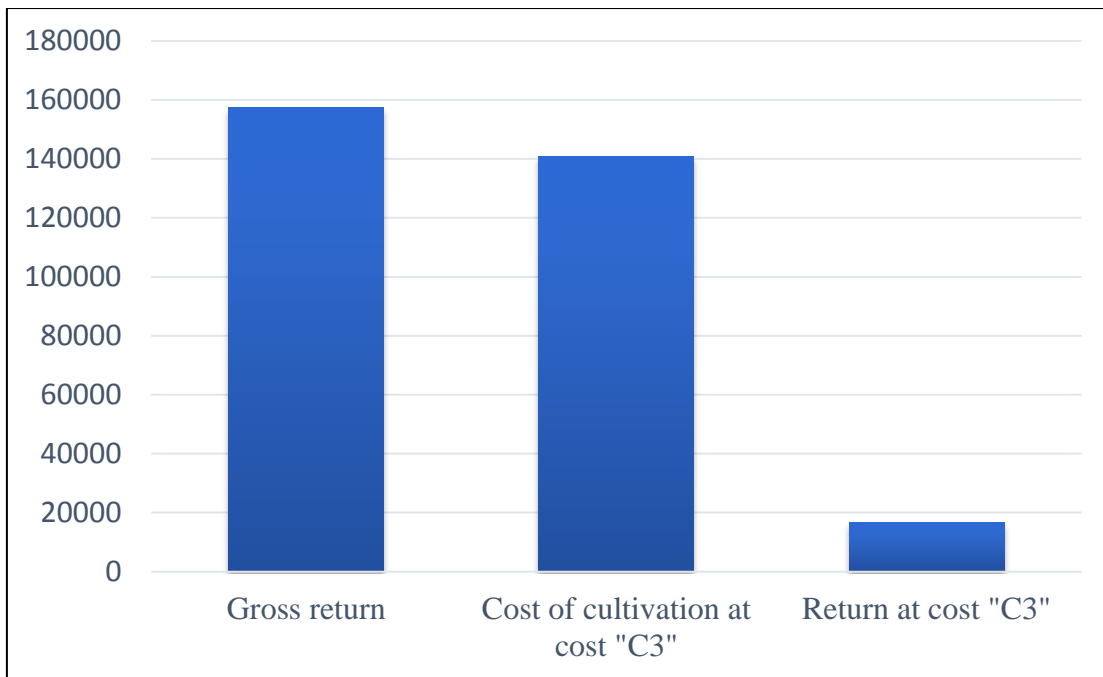
**Fig. 5.8: Per hectare percentage expenditure to total C3**

**5.2.2 Per hectare cost and return from paddy**

**Table 5.5: Per hectare cost and returns from paddy**

(NRs/ha)

<b>S.No.</b>	<b>Particulars</b>	<b>Amount</b>
1	Main produce (q/ha)	40.40
2	Value of main produce	93045.08
3	By-product (q/ha)	55.49
4	Value of by-product	64317.9
5	Gross return	157362.98
6	Cost of cultivation at	
	Cost "A1"	47802.48
	Cost "A2"	71474.48
	Cost "B1"	71474.48
	Cost "B2"	95738.28
	Cost "C1"	103724.48
	Cost "C2"	127988.28
	Cost "C3"	140787.10
7	Return at	
	Cost "A1"	109560.50
	Cost "A2"	85888.50
	Cost "B1"	85888.5
	Cost "B2"	61624.70
	Cost "C1"	53638.50
	Cost "C2"	29374.70
	Cost "C3"	16575.87
8	B:C ratio at	
	Cost "A1"	3.29
	Cost "A2"	2.20
	Cost "B1"	2.20
	Cost "B2"	1.64
	Cost "C1"	1.51
	Cost "C2"	1.22
	Cost "C3"	1.11



**Fig. 5.9: Per hectare cost and returns from Paddy cultivation**

Table-5.5 shows the returns at various cost categories. At cost A1, A2, B1, B2, C1, C2 and C3 the returns were estimated to be NRs 109560.5009, NRs 85888.5008, NRs 85888.5008, NRs 61624.7008, NRs 53638.5008, NRs 29374.7008 and NRs 16575.8727 respectively. Similarly, B:C ratio at cost A1, A2, B1, B2, C1, C2 and C3 were 3.29, 2.20, 2.20, 1.64, 1.51, 1.22 and 1.11 respectively. The B:C ratio of greater than 1 indicates that paddy cultivation was profitable in the study area. Similar kind of finding was found in the study of Yadav *et al.* (2021) where B:C ratio was found 1.11. In the findings of Sapkota & Sapkota (2019), all four varieties of the study had B:C ratio greater than 1. The average B:C ratio was 1.312, 1.202, 1.24 and 1.005 for studied paddy varieties i.e., Sawa, Gorakhnath, Ramdhan and Radha-4 respectively in the Kapilvastu district of Nepal.

### 5.3 Major input constraints faced/perceived by paddy growing farmers

The respondents were asked to rank the given constraints which they perceived as important or first to less important or last.

**Table 5.6: Garrett score**

Garrett Ranking conversion		
Rank	Percent	Score
1	8.34	77
2	25	63
3	41.67	54
4	58.34	46
5	75	37
6	91.67	23

**Table 5.7: Input constraints faced/perceived by sample households**

S.No.	Constraints	Garrett's mean score	Rank
1	High seed and fertilizer cost	61.98	1
2	High labour cost	60.94	2
3	Timely unavailability of fertilizer	58.78	3
4	Timely unavailability of labour	44.75	4
5	Fluctuating market price of inputs	38.87	5
6	Timely unavailability of seeds	34.70	6

The results of table-5.7 revealed that respondents perceived high seed and fertilizer costs as the major constraint, with a Garrett's mean score of 61.98. Another constraint with high labour costs was ranked second with a Garrett's mean score of 60.94. Other constraints included timely unavailability of fertilizer, timely unavailability of labour, fluctuating market prices of inputs and timely unavailability of seeds with Garrett's mean scores of 58.78, 44.75, 38.87, and 34.70, ranking third, fourth, fifth, and sixth, respectively.



## **SUMMARY AND CONCLUSION**

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Rice (*Oryza sativa*) is the major staple crop of Nepal which has major contribution in the food security of the Country. *Oryza sativa* (Asian rice) and *Oryza glaberrima* (African rice) are well known species of rice which are used for consumption purpose. In Nepal, it is grown in a range of altitude from 60m to 3050 m above the sea level but Terai region accounts for the majority of rice cultivation area among the three geographical regions i.e., terai, mid-hills and mountains. Therefore, it is known as Country's granary which accounts for 70% of the total rice production. Rice is cultivated as upland and lowland rice. The lowland rice system covers 75% of the global production. Irrigated and rainfed lowland rice cultivation system is a common rice production system. Rice has fed large number of people in the World since it's domestication as it is the staple food for half of the global population. South Asia is considered as the main region for the production of rice in the World. China and India are the leading countries in rice production among South Asian countries and also within the World. Rice is the primary crop of Nepal because it is contributing to the food security of the Country. As per the latest data of 2019/20, paddy area harvested for Nepal was 1,458,915 ha with production of 5,550,878 Mt. and the yield per hectare was 3.80 Mt/ha. There is a gradual increase in the production of paddy since 1971 to till 2019/20. But despite of the increasing trend, Country's own production is not sufficient to meet the current demand. Therefore, Nepal has imported rice worth 48.14 billion despite of the significant increase in paddy production over the years. Land, water, chemical fertilizers, nutrients and energy are the important input of rice production. But soon there will be decline in these inputs because water resources are declining day by day. The environmental pollution by the haphazard use of chemical fertilizer is negatively affecting both human and soil health. Therefore, there needs to be consciousness in the careful use of these resources. Similarly, labour has become one of the prime constraints in the rice production. The unavailability of human labour, high labour charges are the major concerns related to the labour. Another important constraint in rice production

is the lack of enough rice research in Nepal. Rice research institute namely “Nepal Agriculture Research Council” is also getting very less budget for the agricultural research. To increase the rice production, Nepal’s rice research development programme has prioritized three areas i.e., development and promotion of high yielding, stresses tolerant and better-quality rice varieties, integrated natural resource management for sustainable rice production, Development and promotion of small-scale mechanization and post-harvest technologies.

Kapilvastu is one of the Terai districts of Nepal which has high paddy production record along with other few districts of the Country. Keeping this view, Government of Nepal under Prime Minister Modernization Project (PM-AMP) started Rice zone program in Kapilvastu district in 2017/18 and later in 2019/20, it was upgraded to Rice Super zone. PM-AMP project has aimed for increase in production, productivity and modernization in agriculture sector. The present study is conducted in the two wards i.e., ward 5 and 6 of Kapilavstu district.

In the light of these facts, the present study named “Economic analysis of paddy cultivation in Kapilvastu district of Nepal” was carried out with the following objectives.

- 1) To study the socio-economic profile of the farmers in the study area.
- 2) To estimate cost and returns from the cultivation of paddy crop.
- 3) To study the major input constraints faced/perceived by paddy growing farmers in the study area.

### **6.1 Findings of the study**

- The average family strength was found to be (5.61) people per family. Findings showed that males (18–50 years of age) dominated in family strength, with an average of 1.84 males per family.

- The majority of respondents (45%) were between the ages of 45 and 54 years. The findings also revealed that majority of respondents (57%) were female, with the remainder (43%) being male.
- The respondent's highest level of education is only intermediate. Only 68% of respondents have received formal education.
- Majority of respondents (32%) have less than 10 years of farming experience, followed by 29 percent who have farming experience ranging from 11 to 20 years. Similarly, 23% of respondents have 21 to 30 years of farming experience, and 16% have more than 40 years of farming experience.
- The findings showed that majority of respondents work in service (nearly 30%), foreign employment (nearly 30%), and labour/wages (about 25%), followed by business (nearly 15%), agriculture (nearly 3%), and dairy (nearly 2%) as their primary occupation.
- According to the land use pattern analysis, the average land holding size was found to be 0.46 ha. The average size of the land taken on lease was 0.58 ha, while the leased-out land was 0.54 ha. Similarly, the average irrigated and unirrigated land area in kharif was 0.53 ha and 0.24 ha, respectively. The average cultivated area by the respondents in kharif season was 0.67 ha.
- The analysis of cropping pattern data revealed that kharif crops dominated in the study area, accounting for 56.30 percent of the total gross cropped area. Rabi crops accounted for only 43.70 percent of total gross cropped area. The cropping intensity was found to be 291.13%.
- The cost of cultivation of paddy per hectare was calculated using the CACP concept. The costs A1, A2, B1, B2, C1, C2 and C3 were NRs 47802.48, NRs 71474.48, NRs 71474.48, NRs 95738.28, NRs 103724.48, NRs 127988.28 and NRs 140787.10 respectively. The important percentage share to cost C3 was taken by the imputed value of family labour (22.91), followed by the rental value of own land (17.23), the rental value of land leased in (16.81), hired and owned machinery charges (10.53), hired human labour (10.07), chemical fertilizer (4.17), owned and purchased seed (2.97), irrigation charges

(2.84), interest on working capital (1.92), FYM (1.04), land revenue and taxes (0.4) respectively.

- At cost A1, A2, B1, B2, C1, C2 and C3 the returns were estimated to be NRs 109560.5009, NRs 85888.5008, NRs 85888.5008, NRs 61624.7008, NRs 53638.5008, NRs 29374.7008 and NRs 16575.8727 respectively.
- B:C ratio at cost A1, A2, B1, B2, C1, C2 and C3 were 3.29, 2.20, 2.20, 1.64, 1.51, 1.22 and 1.11 respectively. The B:C ratio of greater than 1 indicates that paddy cultivation was profitable in the study area.
- The constraint analysis using Garrett's ranking technique showed that respondents perceived high seed and fertilizers costs as the major constraint, with a Garrett's mean score of 61.98. Another constraint with high labour costs was ranked second with a Garrett's mean score of 60.94. Other constraints included timely unavailability of fertilizer, timely unavailability of labour, fluctuating market prices of inputs and timely unavailability of seeds with Garrett's mean scores of 58.78, 44.75, 38.87, and 34.70, ranking third, fourth, fifth, and sixth, respectively.

## **6.2 Conclusion**

- The highest level of education among the respondents is limited to intermediate. The study shows that only 68% of the respondents have received formal education.
- Majority of respondents (32%) have less than 10 years of farming experience.
- In the study, it was found that the agriculture as a primary occupation of the respondents is decreasing over time. Only 3% of the respondent's primary occupation is agriculture.
- The cost of paddy cultivation per hectare was calculated using the CACP cost concept. The cost of cultivation (Cost C3) for paddy was found to be NRs 140787.1098. And the return at cost "C3" is NRs 16575.87.

- The B:C ratio is 1.11 which is greater than 1, this indicates that paddy cultivation is profitable in the study area.
- The constraint analysis using Garrett's ranking technique shows that high seed and fertilizer cost is the major input constraint followed by high labour cost, timely unavailability of fertilizer, timely unavailability of labour, fluctuating market prices of inputs and timely unavailability of seeds.

### **6.3 Suggestions**

- Priority should be given in subsidizing the seeds and fertilizer and additionally, there should be timely availability of the inputs.
- Since Benefit-Cost ratio in paddy cultivation is low, therefore farmers should be encouraged to cultivate crops that give high returns.



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# ANNEXURE

## Interview Schedule

Name of the interviewer.....

Date:...../...../2022

### 1. GENERAL INFORMATION

a. Name of the village	b. Ward Number	c. Name of the District

### 2. SOCIO-ECONOMIC PROFILE

a. Name of the Respondent			
b. Gender		c. Age (Year)	
d. Education level		e. Farming experience (Year)	
f. Contact Number			

#### 2.1 Occupation of Respondent (Please√)

a. Agriculture only	b. Dairy	c. Service	d. Business	e. Labour/ wages	f. Foreign Employment	g. Others (Specify)

#### 2.2 About Family Members

Children (less than 18 years)	Adult (18-50 years)		Old (more than 50 years)		Total
	Male	Female	Male	Female	

### 2.3 Land Holding Size (Kattha) 1 ha = ..... Kattha

a. Land holding			b. Total cultivated land			c. Irrigated land			d. Un-irrigated land		
Own	Leased-in	Leased-out	Kharif	Rabi	Summer	Kharif	Rabi	Summer	Kharif	Rabi	Summer

### 3.0 Rental Value of Land

Rental value of land (Rs/kattha/year)	
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### 4.0 Cropping Pattern

Name of the crop	Crop Variety	Area (Kattha)
<b>KHARIF</b>		
a.		
b.		
c.		
d.		
<b>RABI</b>		
a.		
b.		
c.		
d.		
<b>SUMMER</b>		
a.		
b.		
c.		
d.		

Note: In cropping pattern study the varietal impact of paddy

### 5.0 Source of Irrigation (Please√)

a. Ground Water		b. Surface Water (Canal)
Owned Shallow Tube-well water	Purchased Shallow Tube-well water	

**6.0 Household Expenditure (NRs/Year or NRs/Month)**

Food	Clothes	Health Care	Children education	Other's expenditure
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**7.0 Income from Different Sources (NRs/year)**

Source of income	Amount (Rs)	Source of income	Amount (Rs)
a. Agriculture/Crops net income		e. Livestock	
b. Labour/Wages		f. Business	
c. Service/Salary		g. Foreign employment	
d. Milk and Milk Product		h. Others (Please specify)	

**8.0 Cost of Cultivation:****A. Operational Cost: Human Labour (Per Kattha):**

Operations	No. of operations		Family Labour		Hired Labour		Rate (Rs/Day/Labour)	
			Male	Female	Male	Female	Male	Female
Nursery raising		No.						
		Hours						
Ploughing		No.						
		Hours						
Manuring		No.						
		Hours						
Rice transplanting		No.						
		Hours						
Fertilizer application		No.						
		Hours						
Irrigation		No.						
		Hours						
Spraying		No.						
		Hours						
Harvesting		No.						
		Hours						
Threshing		No.						
		Hours						
Others		No.						
		Hours						

**B. Operational Cost : Machine Labour (Per Kattha)**

<b>Operations</b>	<b>Time of Operations/ Quantity</b>	<b>Rate (Rs/Hour)</b>
Ploughing		
Manuring		
Transplanting		
Fertilizer application		
Irrigation		
Spraying		
Harvesting		
Threshing		
Others		

**C. Material Cost: (per kattha)**

<b>Items</b>	<b>Quantity</b>	<b>Rate</b>
1. Seed		
2. Farm Yard Manure		
3. Chemical Fertilizers		
a. Urea		
b. DAP		
c. Potash		
4. Pesticides/ Insecticides		
5. Irrigation		
a. No. of irrigation		
b. Hour/Irrigation		
c. Rate (Rs/hour)		

**9. Paddy Yield (Quintal/Kattha) and Market Price (Rs/Quintal)**

Yield of paddy	By-Product Yield	Market price of paddy	Market price of by-product

**10. What type of constraint are you facing in terms of input availability? (Please√)**

Timely unavailability of seeds	Timely unavailability of fertilizer	Timely unavailability of labor	High seed and fertilizer cost	High labor cost	Fluctuating market price	Others

If others, please mention the constraints.....

**GARRETT RANKING CONVERSION TABLE****The conversion of orders of merits into units of amount of “soces”**

<b>Percent</b>	<b>Score</b>	<b>Percent</b>	<b>Score</b>	<b>Percent</b>	<b>Score</b>
0.09	99	22.32	65	83.31	31
0.20	98	23.88	64	84.56	30
0.32	97	25.48	63	85.75	29
0.45	96	27.15	62	86.89	28
0.61	95	28.86	61	87.96	27
0.78	94	30.61	60	88.97	26
0.97	93	32.42	59	89.94	25
1.18	92	34.25	58	90.83	24
1.42	91	36.15	57	91.67	23
1.68	90	38.06	56	92.45	22
1.96	89	40.01	55	93.19	21
2.28	88	41.97	54	93.86	20
2.69	87	43.97	53	94.49	19
3.01	86	45.97	52	95.08	18
3.43	85	47.98	51	95.62	17
3.89	84	50.00	50	96.11	16
4.38	83	52.02	49	96.57	15
4.92	82	54.03	48	96.99	14
5.51	81	56.03	47	97.37	13
6.14	80	58.03	46	97.72	12
6.81	79	59.99	45	98.04	11
7.55	78	61.94	44	98.32	10
8.33	77	63.85	43	98.58	9
9.17	76	65.75	42	98.82	8
10.06	75	67.48	41	99.03	7
11.03	74	69.39	40	99.22	6
12.04	73	71.14	39	99.39	5
13.11	72	72.85	38	99.55	4
14.25	71	74.52	37	99.68	3
15.44	70	76.12	36	99.80	2
16.69	69	77.68	35	99.91	1
18.01	68	79.17	34	100.00	0
19.39	67	80.61	33		
20.93	66	81.99	32		