



International Journal of Graduate Research and Review

ISSN: 2467-9283



Indexing and Abstracting

*InfoBase Index, Cosmos, Open Academic Journals Index (OAJI),
InfoBase Index, Cosmos, ResearchGate, CiteFactor, Scholar
Stear, JourInfo, ISRA: Journal-Impact-Factor (JIF), Root
Indexing etc*

Impact Factors*

IBI factor: 3

Impact factor (OAJI): 0.201

Vol-7, Issue-3

August 2021



SEM-Biotech
Publishing



Research Article

An Analysis of Provincial Paddy Production Status of Nepal

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Article Information

Received: 20 July 2021
Revised version received: 11 August 2021
Accepted: 14 August 2021
Published: 30 August 2021

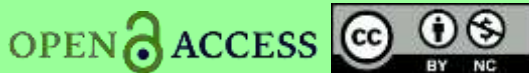
Cite this article as:

A. Kandel et al. (2021) Int. J. Grad. Res. Rev. Vol 7(3): 113-117.

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Peer reviewed under authority of IJGRR
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Review



Abstract

Rice, the principal food grain, is grown extensively in all agro-ecological zones of Nepal, ranging from Terai belt (as low as 60 masl) to high hills (as high as 3050 masl). This study analyzes the production trend of paddy crop in seven different provinces of Nepal. Statistical data (2014/15-2018/19) published by the Ministry of Agriculture and Livestock Development is used to calculate the annual average area of production and yield of the crop. The result shows that in the past five years, the productivity of the crop has increased by 12.53%, 21.17%, 4.84%, 9.03%, 2.65%, 8.1% and 26.92% in Province No. 1, Province No.2, Bagmati, Gandaki, Karnali province and Sudurpaschim respectively. Among the provinces, the highest average annual cultivated area (361,816.8 ha) and the highest average annual production (1,194,915.6 mt) of paddy crop is observed in Province No. 2. The location of the province on flat plains of Terai, favorable climatic conditions, timely availability of quality inputs and possibility of farm mechanization has favored the higher production in this province. Whereas, Karnali province suffers the lowest average annual area of production (49,420.4 ha) with the lowest average annual production (157,462.4 mt) due to its difficult land topography and remoteness impeding the supply of inputs on time.

Keywords: Paddy; Yield; Production; Area; Province; Nepal.

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Introduction

Rice is the major staple food crop of Nepal. Among cereals, it is predominant in the Nepalese diet, contributing about one-third of the total calorie intake (Tripathi et al., 2019). Apart from being a key source of nutrition, it also plays an important role in country's economy, contributing more than 7% to GDP (Poudel, 2020). It is cultivated extensively under a wide range of agro-ecological zones ranging as low as the altitude of 60 meter above sea level (in Jhapa) to as high as the altitude of 3050 meter above sea level (in Chumchure, Jumla) and under three major production environments: irrigated, rainfed lowland and upland (CDD,

2015). It requires high humidity, prolonged sunshine and sufficient amount of rainfall for optimum production (MoAaFW, 2021).

In Nepal, mainly, the planting of the crop begins with the inception of monsoon (from June to mid-August) and is harvested in November. Approximately, 92% of the paddy cultivation area lies under the main season (*Barkhe*), 7% under the spring season (*Chaite*) and less than 1% under the winter season (*Boro*). Given the favorable climatic condition and land topography, Terai belt of Nepal dominates the country's domestic production accounting



for 70% of the total and hence, called the granary basket of Nepal (CDD, 2015). Jhapa district of Province No. 1 was declared the first ‘rice super zone’ by Prime Minister Agriculture Modernization Project (PM-AMP), due to higher production (MoAD, 2016).

Rice occupies the topmost position as compared to other cereals, in terms of area and production. According to the fiscal year 2018/19, the total area of rice production was 1,491,744 ha (approximately 48% of the total cultivated agricultural land) with the production of 5,610,011 mt and productivity of 3.76 mt/ha (MoALD, 2020). The production trend seems to be fluctuating at different years. Although, area coverage and production of rice crop is increasing in Nepal, there is still a rice deficit in different parts of the country. The import of the crop has surpassed the export leading to the trade deficit (Kumar, 2021). The study is conducted to explore the production trend and yield analysis of paddy crops of five years in different provinces of Nepal. It also aims to suggest the area where further research should focus on.

Materials and Methods

We collected data regarding area of cultivation (hectare), production (Mt) and yield (Mt/ha) of seven provinces of Nepal from the book Statistical Information on Nepalese Agriculture published by MoALD from fiscal year 2014/15 to 2018/19 and reviewed various literatures related to status of paddy in Nepal. In order to calculate the average area, production and yield for the period of five years of each province to compare each year area, production and yield of seven provinces we used equations shown in Box 1.

On the part of statistical analysis of area, production and productivity and data visualisation, we used Microsoft Excel program and R-Studio respectively.

Result and Discussion

Recommended Varieties for Various Domains

The recommended varieties of paddy for different domains are shown in Table 1.

Box 1: Equations used in the study

$$AAA_{\text{province}} = (\text{Area}_{2014/15} + \text{Area}_{2015/16} + \dots + \text{Area}_{2018/19}) / \text{No. of years} \dots \dots \dots (1)$$

$$AAP_{\text{province}} = (\text{Production}_{2014/15} + \text{Production}_{2015/16} + \dots + \text{Production}_{2018/19}) / \text{No. of years} \dots \dots (2)$$

$$AAY_{\text{province}} = (\text{Yield}_{2014/15} + \text{Yield}_{2015/16} + \dots + \text{Yield}_{2018/19}) / \text{No. of years} \dots \dots \dots (3)$$

Where,

AAA= Average Annual Area

AAP= Average Annual Production

AAY= Average Annual Yield

Table 1: Recommended varieties for various domains.

Name of variety	Recommended domain
Spring Rice	
C.H.45	Terai, Inner Terai, Mid Hill
Bindeshwori	Terai, Inner Terai, Mid Hill
Chaite 6	Irrigated region of Terai and Inner Terai
Hardinath 1	Terai, inner Terai, River basin up to 800 m
Summer Rice	
Tainan 1	Hill
Mansuli	Terai And Inner Terai
Khumal 3	Mid Hill
Khumal 2	Kathmandu Valley and with similar Climatic Condition as Kathmandu valley of mid hill (3000 masl to 4500 masl)
Khumal 5	Western mid hill districts (1000 to 1400 masl) such as Parbat, Baglung, Myagdi
Radha 7	Terai, Mid Hill, and rainfed area with similar Climatic Condition to these area
Chandannath 1	Jumla or area with same climatic region
Chandannath 3	Jumla or area with same climatic region
Khumal 11	Kathmandu Valley

[Source: Agriculture and Livestock Diary, 2078]



Province-Wise Area Under Paddy Cultivation

Among the seven provinces, Province No 2 had the highest cultivated area of paddy in the fiscal year 2014/15 (326501 ha), 2016/17 (403700 ha), 2015/16 (382,137 ha) and 2018/19 (401906 ha) and in the year 2015/16, Province No 1 (306272 ha) had the maximum cultivated area and in Karnali province area under paddy cultivation was the lowest in all five years (Fig. 1). Additionally, the percentage increase in area of cultivation in 2018/19 as compared to 2014/15 was 5.41% and 23.1% for Province No 1 and Province No 2 respectively, whereas for Bagmati, Gandaki, Province No 5, Karnali and Sudurpaschim province, the area of under paddy cultivation was decreased in the year 2018/19 as compared to 2014/15 by 1.67 %, 4.3%, 3.7%, 8.52% and 1.801% respectively. The total average annual area of cultivation of paddy for the period of five years from 2014/15 to 2018/19 was 1,484,584 hectare. The percentage of average annual area occupied by each province is shown in the Fig. 2.

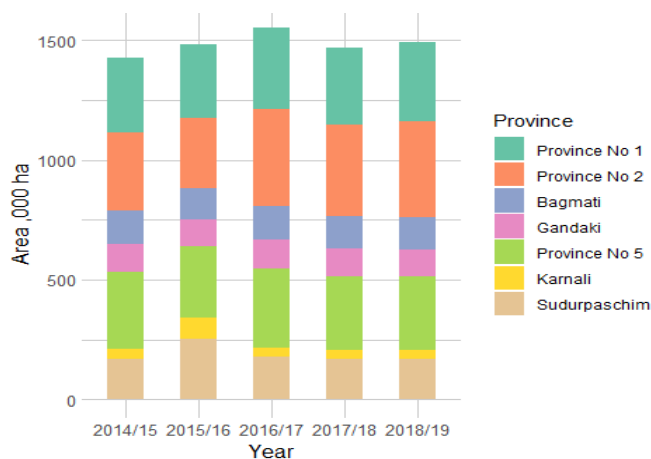


Fig. 1: Area under paddy cultivation of seven provinces during five-year period.

[Source: MoALD (2016 - 2020), Statistical Information on Nepalese Agriculture, 2014/15 - 2018/19]

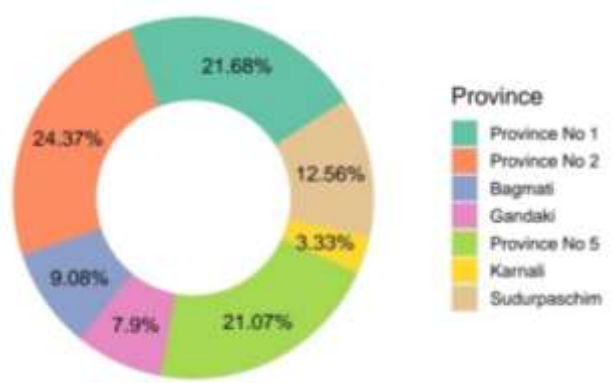


Fig. 2: Percentage of average annual area occupied by each province.

[Source: MoALD (2016 - 2020), Statistical Information on Nepalese Agriculture, 2014/15 - 2018/19]

Paddy was grown in area more than provincial average in the years 2016/17, 2017/18 and 2018/19 for Province No 1 and Province No 2, whereas in the years 2015/16 and 2014/15, the area occupied by the paddy was below average for both provinces. For Bagmati and Gandaki province, the cultivated area was higher than provincial average in the years 2014/15 and 2016/17, however the area under paddy cultivation was lower than provincial average in the years 2015/16, 2017/18 and 2018/19. In Province No 5, the area under paddy was higher than provincial average for the years 2014/15 and 2016/17 whereas, for years 2015/16, 2017/18 and 2018/19, it was lower than average. While in Karnali and Sudurpaschim province, the area under paddy cultivation was higher than provincial average for years 2015/16 and for years 2014/15, 2016/17, 2017/18 and 2018/19, the paddy cultivation area was below average.

Province-Wise Paddy Production

Among the seven provinces, Province No 2 had the highest production of paddy in the fiscal year 2016/17 (1305411 Mt), 2017/18 (1285843 Mt) and 2018/19 (1495044 Mt) and in the year 2015/16 (987347 Mt) and 2014/15 (1202724 Mt) Province No 1 and Province No 5 had the maximum paddy production respectively, and in Karnali province paddy production was the lowest in all five years (Fig. 3). Also, the percentage increase in paddy production in 2018/19 as compared to 2014/15 was 18.4%, 49.22%, 3%, 4.41% and 24.23% for Province No 1, Province No 2, Bagmati, Gandaki and Sudurpaschim province respectively, whereas for Province No 5 and Karnali province, the area of under paddy cultivation was decreased in the year 2018/19 as compared to 2014/15 by 1.17% and 1.23% respectively. The average annual production (in Metric ton) of paddy for the period of five years from 2014/15 to 2018/19 was 5,084,816 Mt. The percentage of average production in each province is shown in the Fig. 4.

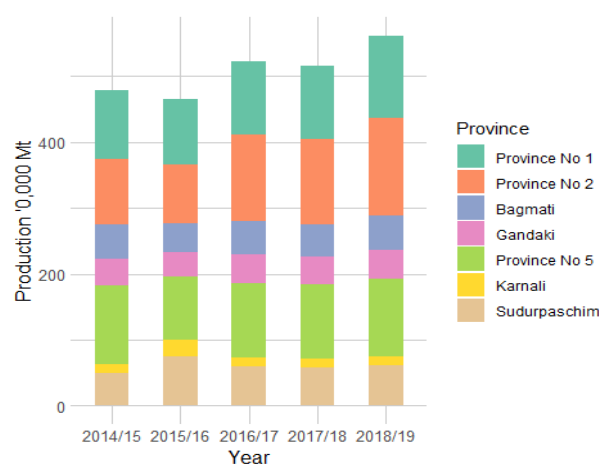


Fig. 3: Paddy production of seven provinces during five-year period.

[Source: MoALD (2016 - 2020), Statistical Information on Nepalese Agriculture, 2014/15 - 2018/19]

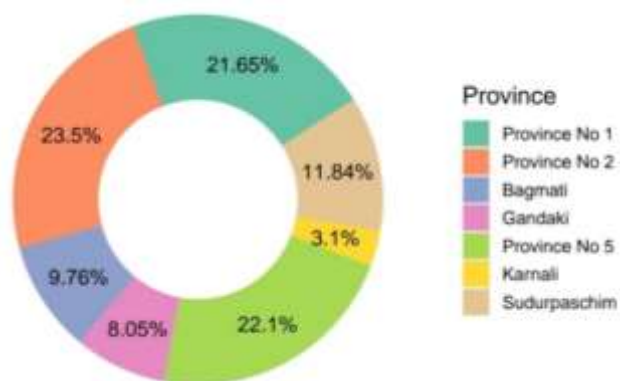


Fig. 4: Percentage of average annual production produced by each province.

[Source: MoALD (2016 - 2020), Statistical Information on Nepalese Agriculture, 2014/15 - 2018/19]

The production of paddy was more than provincial average in the years 2016/17, 2017/18 and 2018/19 for Province No 1 and Province No 2, whereas in the years 2015/16, paddy production was below average for both provinces. For Bagmati and Gandaki province, the production was higher than provincial average in the years 2014/15, 2016/17, 2017/18 and 2018/19, however the production was lower than provincial average in the year 2015/16. In Province No 5, paddy production was more than provincial average for the years 2014/15, 2016/17 and 2018/19, whereas, for years 2015/16 and 2017/18, the production was below the provincial average. While in Karnali province, the production was higher than provincial average for year 2015/16 and for years 2014/15, 2016/17, 2017/18 and 2018/19, the production was below average. Lastly, in Sudurpaschim province, the production was more than provincial average for the years 2015/16 and 2018/19 and in the years 2014/15, 2016/17 and 2017/18, the production was below provincial average.

Province-Wise Yield of Paddy (Mt/ha)

The highest yield was observed in Bagmati province in the year 2015/16 (3.40 Mt/ha), 2016/17 (3.62 Mt/ha), 2017/18 (3.77 Mt/ha) and 2018/19 (3.9 Mt/ha) whereas, in the year 2014/15, Province No 5 had the highest yield (3.77 Mt/ha). And, the lowest yield was observed in Karnali province in the years 2015/16 (2.88 Mt/ha), 2017/18 (3.43 Mt/ha) and 2018/19 (3.47 Mt/ha), whereas in the year 2016/17 (3.23 Mt/ha) and 2014/15 (2.86 Mt/ha), the lowest yield was observed in Province No 2 and Sudurpaschim province respectively (Table 2). The percentage increase in yield of paddy in 2018/19 as compared to 2014/15 was 12.53%, 21.17%, 4.84%, 9.03%, 2.65%, 8.1% and 26.92% for Province No 1, Province No 2, Bagmati, Gandaki, Province No 5, Karnali and Sudurpaschim province respectively.

The production system is influenced by several factors viz. adequate rainfall, availability of irrigation supply for maintaining optimum soil moisture during growth, timely availability of chemical fertilizers and improved and hybrid varieties of seeds (Basyal et al., 2019). The graph showed province no. 2 as the highest producer of rice. This is mainly due to the fact that this province includes terai belt, of which climatic condition and land topography is well-suited for the production (MoALD, 2020). Beside these, farm mechanization has replaced the traditional farming practices, facilitating the cultivation. Whereas, the climatic condition and land topography of Karnali province has been hindering the paddy production. In addition to these, the inaccessibility has hampered farm mechanization and availability of improved and hybrid seed as well as chemical fertilizer in time, resulting in the lowest production among all the provinces (Joshi et al., 2011).

Table 2: Annual paddy yield of seven provinces during five-year period.

Name of province	2014/15	2015/16	2016/17	2017/18	2018/19	Average
Province No 1	3.35	3.22	3.31	3.44	3.77	3.42
Province No 2	3.07	3.01	3.23	3.36	3.72	3.30
Bagmati	3.72	3.40	3.62	3.77	3.9	3.68
Gandaki	3.43	3.17	3.48	3.62	3.74	3.49
Province No 5	3.77	3.25	3.46	3.6	3.87	3.59
Karnali	3.21	2.88	3.31	3.43	3.47	3.19
Sudurpaschim	2.86	2.94	3.36	3.5	3.63	3.23

[Source: MoALD (2016 - 2020), Statistical Information on Nepalese Agriculture, 2014/15 - 2018/19]



Conclusion

Analysis of statistics of paddy from the year 2014/15 to 2018/19 showed that Province No 2 had the maximum average annual area (361816.8 ha) and average annual production (1194915.6 Mt), whereas Karnali province had the least average annual area (49420.4 ha) and average annual production (157462.4 Mt). Such high area and production of paddy in the Province No 2 can be attributed to its well-suited climate, soil and timely availability of essential resources. In contrast, situated in the hills with inaccessible topography and less suitable soil, Karnali Province occupies the lowest rank in terms of area and production of paddy. Instead of expanding the cultivation area, the best way for increasing the paddy production to meet the demands of the growing population is through improvement in productivity. The productivity of the crop can be enhanced through the use of improved and hybrid seeds, access to adequate water supply under rainfed conditions, judicious use of chemical fertilizers and pesticides and adoption of good agricultural practices.

Conflict of Interest

The authors declare that there is no conflict of interest with present publication.

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