

# Assessment of Rice Status in Terai Madhesh Cluster (TMC) of Nepal

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## Abstract

This study was carried out in the 21 districts of Terai Madhesh Cluster (TMC) from Ilam in East to Kanchanpur in West by adopting the data from Ministry of Agriculture and Livestock Development, Singhadurbar, Kathmandu from 2000/01 to 2019/20. The main objective of this study is to review the status of rice at Terai Madhesh Cluster (TMC) of Nepal through trend analysis and to assess the Strengths, Weakness, Opportunities and Threats (SWOT) analysis and intervention strategy development. The growth rate in the area of rice was found in 'Decreasing Trend' while the growth rate of production of rice was found in 'Increasing Trend' within TMC. The average annual growth rate in the yield of rice in both TMC and National level was found in increasing trend but the average annual growth of rice yield in TMC was found comparatively higher than national level in past 2 decades which clearly indicates TMC as rice basket of Nepal. The SWOT analysis of rice sub-sector had found the need of strengthening the inputs, production, marketing, and processing and value addition strategies of rice. Hence, the government of Nepal should have to either formulate new or amend existing Land Use Policy to stop the decreasing trend in the growth rate of area of rice. Similarly, inputs, production, marketing, and processing and value addition strategies of rice should be further strengthened in order to maintain food security in country with overall prosperity.

**Keywords:** Rice; Trend analysis; SWOT; TMC; Food security

## Introduction

Rice is one of the most important staple food for Nepalese people and it is estimated that Nepal began producing rice commercially around 500 years ago (Agrama et al., 2010; Mallick, 1982). According to CDD (2015) it accounts 40% of their daily caloric intake. In the global scenario of increasing food demand every year adoption of strategies for improving the production and productivity of rice will be the very secure option for the Least developed country (LDC) like Nepal in order to maintain food security in the country because Fageria (2007) had claimed that in order to meet the food needs of the anticipated world population in 2025 farmers worldwide will need to produce around 60% more rice than they do now. The Terai Madhesh Cluster (TMC) is rice basket of Nepal. The majority of farm households in the Terai region of Nepal depend on rice production for their livelihood. However, during the past 20 years, production growth has only averaged 1.4% annually. About 70% of the total amount of rice produced is consumed at home. But for the majority of subsistence farmers, rice production only provides a portion of the food needed for their households each year (Ghimire et al., 2013). The production area, production and productivity of spring season rice in Madhesh province of Nepal is 36672 ha, 170618 MT and 4.65

respectively. Similarly, the production area, production and productivity of main season rice in Madhesh Province of Nepal is 345603 ha, 1262200 MT and 3.65 MT/ha, respectively. The productivity of the spring season rice is comparatively higher as compared to the main season rice in Madhesh province (Ministry of Agriculture and Livestock Development, 2022).

In the fiscal year 2020/21 Nepal was found importing seven different items of rice or rice products which are seed of rice, husked (brown) rice, semi-milled or wholly milled rice (polished or glazed), semi-milled or wholly milled rice, (polished or glazed), broken rice, beaten Rice (*Chiura*) and others Rice while Nepal was found exporting just two items of rice or rice products which are *Dhan ko Bhuja (Murhi)* and Beaten Rice (*Chiura*) in the fiscal year 2020/2. It is clearly indication of unbalanced and weak export diversification of rice or rice products. Nepal was found exporting 1,334,364,834 kg of rice or rice products worth NPR 50,788,367,000 while it was exporting just 690,522 kg of rice or rice products worth NPR 220,837,000 in fiscal year 2020/21. It clearly indicates that Nepal is highly suffering trade deficit in rice trade (Ministry of Agriculture and Livestock Development, 2022).

### Materials and Methods

The 21 districts of Terai Madhesh Cluster (TMC) in Nepal spanning from Ilam in the east to Kanchanpur in the west was chosen for study. The information used in this study was taken from several publications produced by the Ministry of Agriculture and Livestock Development, Singhadurbar, Kathmandu between 2000/01 and 2019/20. Utilizing Microsoft Excel 2013, the data thus gathered was analyzed and interpreted.

### Results and Discussions

#### Area and production of rice in TMC in 2019/2020

In Terai Madhesh Cluster (TMC) the area of rice was found highest in Morang district which is 86,634 ha followed by Jhapa and Kailali districts with 84,875 ha and 71,710 ha respectively. Similarly, the production of the rice was found highest in Jhapa district which is 373,732 MT followed by Morang and Kailali district which is 367,070 MT and 306,202 (Figure 1).

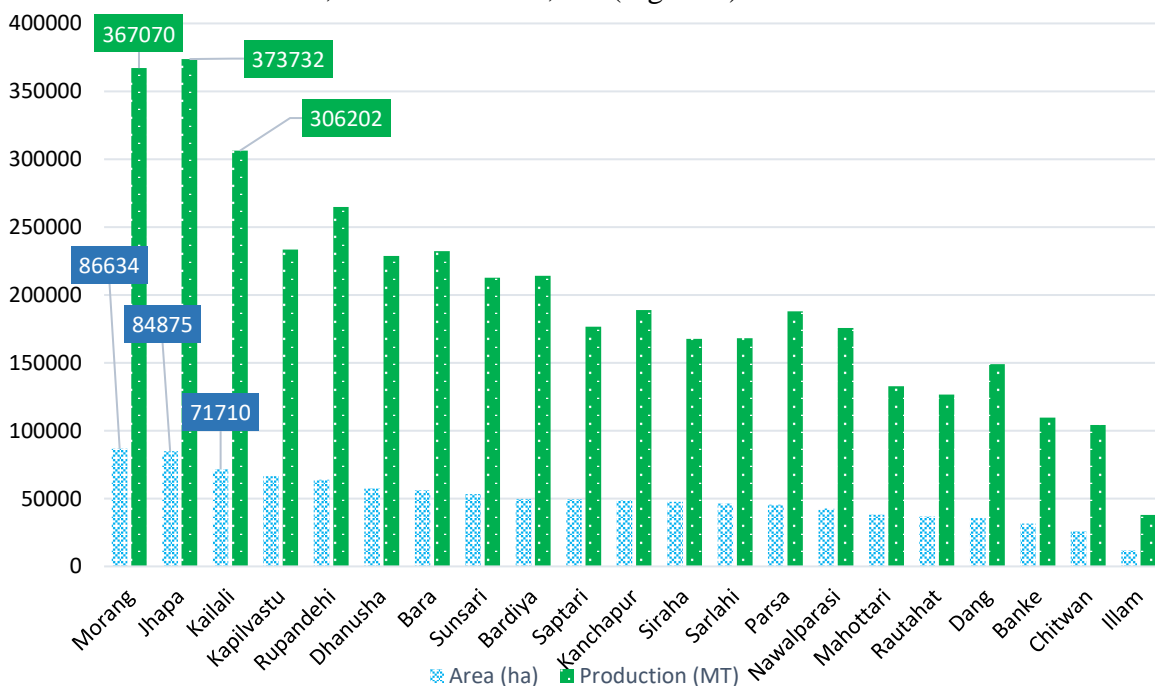
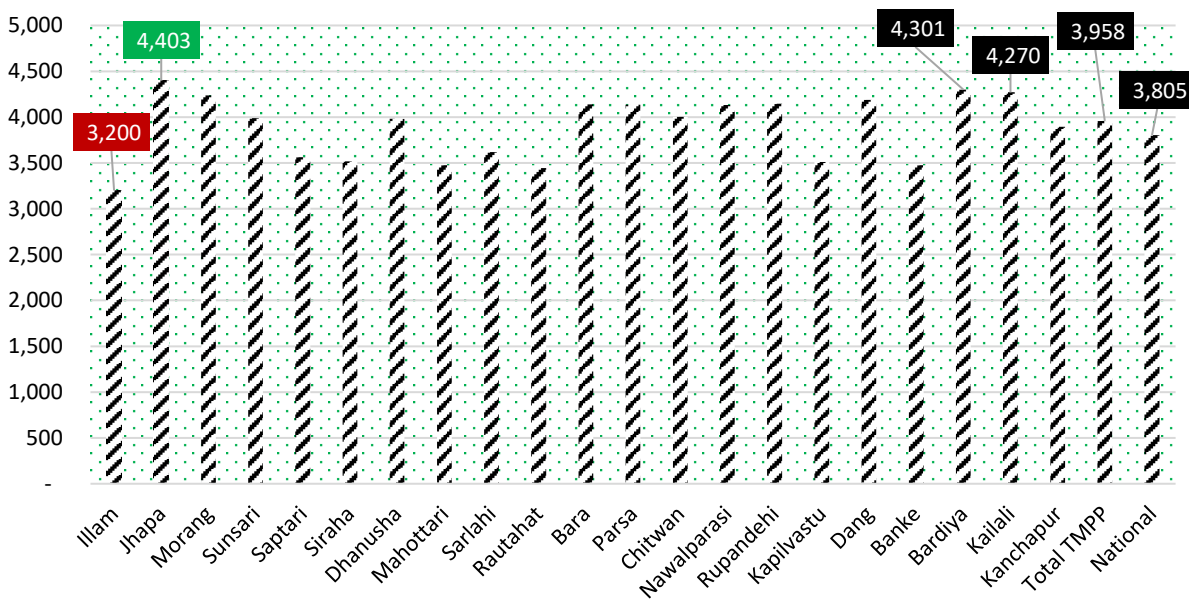


Fig. 1. Area and production of rice in TMC in 2019/2020

**Yield of rice in TMC districts in 2019/2020 (in kg/ha)**

The yield of rice was found highest in Jhapa (4,403 kg/ha) followed by Bardiya (4,301 kg/ha) and Kailali (4,270 kg/ha) in fiscal year 2019/2020 . Similarly, the yield of rice was found lowest in Illam (3,200 kg/ha). The yield of rice (3,958 kg/ha) within Terai Madhesh Prosperity Program (TMPP)/TMC was found comparatively higher than average national level yield (3,805 kg/ha) (Figure 2). It clearly indicates that TMC is the rice basket of Nepal. In context of South Asia and its periphery countries the productivity of rice is comparatively low. In the same line FAOSTAT (2019) had found lower productivity of Nepal's rice sub-sector than that of its neighbors Bangladesh, China, India and Pakistan.



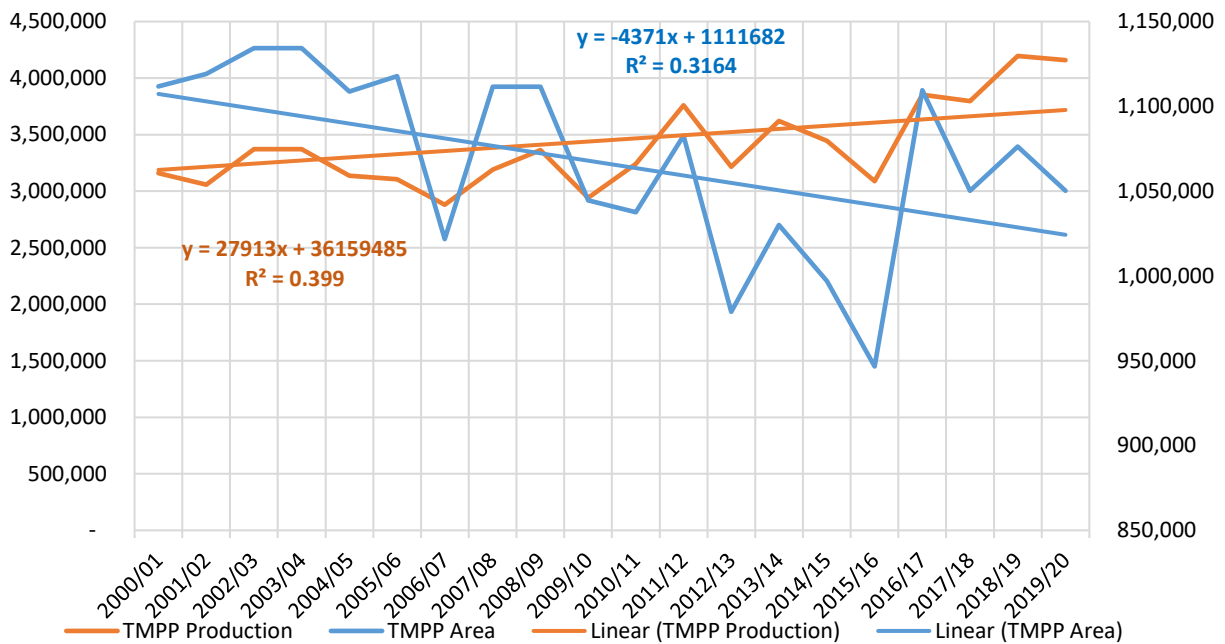
**Fig. 2.** Yield of rice in TMC districts in 2019/2020 (in kg/ha)

**Trends of rice area (in ha) and production (in MT) within 20 years in TMC**

The annual growth rate of area and production of rice in TMC/TMPP was found 4,371 ha (in negative direction) and 27,913 MT respectively within 20 years trend. The growth rate in the area of rice was found in ‘Decreasing Trend’ while the growth rate of production of rice in TMC/TMPP was found in ‘Increasing Trend’ (Figure 3). This finding is in line with Gairhe et al, (2018) where they found the growth rate of rice production and yield with increasing trend and growth rate of area of rice with decreasing trend. They claimed that the main reason behind the increase in the production and productivity of rice is due to the use of improved rice varieties, irrigation, and fertilizer. In the similar scenario, Upadhyay et al, (2019) claimed that the technological innovation has the major role in increasing the production and productivity of crops in Nepal than other factors. The reduction in the growth rate of area may have been seen due to increasing rate of plotting agriculture land for the settlement purposes. In the same line, Paudel et al., (2013) had claimed that higher land fragmentation and accelerated conversion of agriculture land into non agriculture purpose as the major threat to food security in Nepal.

In such context, Ghimire et al., (2015) had identified the need of governmental intervention in order to raise the educational level of farming households and create programs for rice seed varieties that give farmers a range of options from the right germplasm pools (right seeds). In the long run, these programs

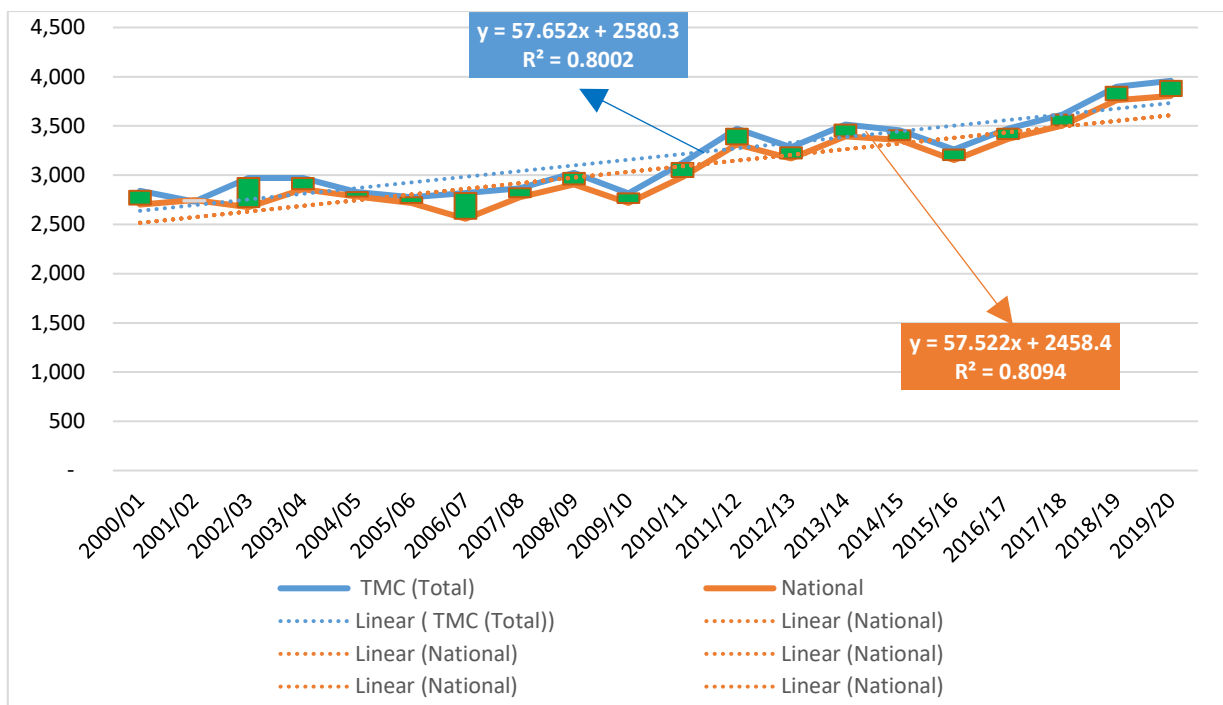
assist farmers in adopting more profit-oriented behavior, which is required to increase adoption rates, productivity and food security.



**Fig. 3.** Trends of rice area (in ha) and production (in MT) within 20 years in TMC

**Comparative trend analysis in the productivity (kg/ha) of rice between National level and TMC within 20 years**

The average annual growth rate in the yield of rice in both TMC and National level was found in increasing trend but the average annual growth rate of rice yield in TMC was found comparatively less than national level in past 2 decades. The average annual growth rate of rice yield (57.652 kg/ha) in TMC was found comparatively higher than National level (57.52 kg/ha). Eventhough the rice yield in TMC seems more than that of national level it is very less as compared to neighbouring countries because according to study by FAOSTAT (2019) the yearly growth rate of rice production in Nepal between 1960 and 2017 was found to be 1.14% which was significantly lower than that of its neighbors including India (2.5%), Bangladesh (3%) and China (4.2%), as well as the global average (4.5%).



**Fig. 3.** Comparative trend analysis in the productivity (kg/ha) of rice between National level and TMC within 20 years

**SWOT analysis of major cereals (rice)**

Low productivity, low organic matter in soil, market price fluctuation, land fragmentation, low yielding varieties adoption, low farm mechanization are major binding constraints in cereal in TMC details SWOT analysis of rice is presented in Table 1.

**Table 1.** SWOT analysis of rice/paddy

Aspects	Strength	Weakness	Opportunities	Threats
<b>Inputs</b>	<ul style="list-style-type: none"> <li>Rice is a key food crop for improving livelihoods and ensuring national food security in Nepal (Gaire et al., 2021).</li> <li>Agriculture policy, Agriculture Development Strategies are under implementatio</li> </ul>	<ul style="list-style-type: none"> <li>Lack of quality agricultural production inputs like seed, fertilizer, irrigation, machineries for rice farming</li> <li>Unavailability of quality seeds (replacement of seed and varieties)</li> <li>)</li> <li>Weak and insufficient plant quarantine check post.</li> </ul>	<ul style="list-style-type: none"> <li>Rice product diversification has increased revenue and opened up opportunities for employment (Adhikari et al., 2018).</li> <li>Production based subsidy system.</li> <li>Many scented and aromatic rice local and improve varieties available having a great</li> </ul>	<ul style="list-style-type: none"> <li>A slight decrease in rice yields can have a devastating effect on household food security in Nepal because of the country's subsistence-based economy Karn (2014). Allocation of</li> </ul>

	<p>n for factor of production promotion and targeted Terai for supply driven rice farming</p> <ul style="list-style-type: none"> <li>• Farm mechanization is initiated in rice farming in Terai of Nepal</li> <li>• Subsidies to the farmers for inputs in rice farming.</li> </ul>	<ul style="list-style-type: none"> <li>• Investment in rice input based research is very less.</li> <li>• Proposal/application based incentive or subsidy system.</li> <li>• Scatter land holding.</li> </ul>	<p>demand in local and international market</p> <ul style="list-style-type: none"> <li>• Various resource conserving technologies are available (not chiefly) to make production less drudgery, high water efficient and more productive</li> </ul>	<p>the budget is insufficient for the inputs procurement</p> <ul style="list-style-type: none"> <li>• Fluctuations in input and output prices of agriculture commodities</li> <li>• Incoherent government policies .</li> </ul>
<b>Production</b>	<ul style="list-style-type: none"> <li>• Climate and Geography of Terai support rice farming.</li> <li>• Agriculture insurance policies is in practice for rice farm.</li> <li>• Allocation of the budget in rice sector is increasing than before.</li> </ul>	<ul style="list-style-type: none"> <li>• Interest of Youth population (Golf, Japan Korea, etc. returned) in farming is in increasing trend.</li> <li>• Insufficient technician in rice development</li> <li>• Per unit production of the land is less as compared to the attainable yield and yield of the neighbor countries.</li> <li>• High production cost</li> <li>• Attraction of the educated youth in rice farming is very less.</li> <li>• Low mechanization.</li> <li>• Increase disease pest resurgence.</li> </ul>	<ul style="list-style-type: none"> <li>• Scope to increase in the production of the rice area and make self-sufficient in rice production.</li> <li>• High tech rice farming</li> <li>• Contact /lease hold/cooperative rice farming</li> <li>• Increase cropping intensity (two Season rice)</li> <li>• High import thus has high demand.</li> </ul>	<ul style="list-style-type: none"> <li>• Climate change</li> <li>• Rural youth migration</li> <li>• Less interest paid by the rice farmers</li> <li>• Fragmentation of the agricultural land</li> <li>• Erratic and uneven monsoon rainfall have great effect on production</li> <li>• Week barrier to entry for competitor.</li> <li>• Free/open boarder with India.</li> <li>• Increased production cost.</li> </ul>

<p><b>Marketing</b></p>	<ul style="list-style-type: none"> <li>• According to Alexandratos and Jelle (2012), rice accounts for 20% of the world's dietary energy supply. Hence, there is a tremendous demand of rice in world.</li> <li>• Road connection to all wards.</li> <li>• Access of electricity in all wards</li> <li>• Big market as well as wholesale/retail market is available</li> <li>• No market advertising</li> </ul>	<ul style="list-style-type: none"> <li>• Due to limited production and an increase in population with heterogeneous preferences, rice imports have recently surged dramatically (Gairhe et al., 2018).</li> <li>• Agricultural cooperatives are interested only in government subsidy rather than marketing of rice</li> <li>• Lack and unscientific minimum support price for rice</li> <li>• Weak rice marketing system and network</li> <li>• Market price information system is weak and ineffective</li> <li>• Weak coordination among the stakeholders</li> <li>• Agricultural policy is not working properly</li> <li>• Private sector investment is very less in rice marketing.</li> </ul>	<ul style="list-style-type: none"> <li>• Can be processed to Beaten rice (<i>Cheura</i>) and Pop rice (<i>Bhujha</i>) which has wide acceptance in Nepal</li> <li>• Commercialization of the rice by PMAMP</li> <li>• Promote the exportable rice product</li> <li>• Processing, preservation and storage facilities of Rice</li> </ul>	<ul style="list-style-type: none"> <li>• Weak coordination between line ministries</li> <li>• Security of the private sector investment in rice marketing</li> <li>• Sufficient finance institution</li> <li>• Good information network and communication</li> </ul>
<p><b>Processing and value addition</b></p>	<ul style="list-style-type: none"> <li>• Food habit of the people is changing trend</li> </ul>	<ul style="list-style-type: none"> <li>• Value chain approach is not properly in practice for rice</li> </ul>	<ul style="list-style-type: none"> <li>• According to Dhungel and Acharya (2017), rice consumption</li> </ul>	<ul style="list-style-type: none"> <li>• Rice processing units were categorized</li> </ul>

	<p>toward fine grain rice</p> <ul style="list-style-type: none"> <li>• Nepal is a member of WTO</li> <li>• NGOs and co-operative based on agriculture processing and value addition</li> <li>• Availability of raw material for the mill</li> <li>• Government has agro &amp; food processing industries policy and support for agro-processing as it is one of the important agribusiness.</li> <li>• with the objectives of enhancing farmers' income, value addition of agro produce</li> <li>• The size of the domestic market is huge.</li> <li>• Vast network of manufacturing facilities of the equipment / machineries</li> </ul>	<ul style="list-style-type: none"> <li>• Less attention is paid in value addition</li> <li>• Since the end product is similar to already available product in market there is competition from the millers of India</li> <li>• Establishing Rice milling business capital intensive</li> <li>• Requirement of high working capital to run the business since procurement and storage of raw materials need substantial investment</li> <li>• Inadequate automation with respect to information management</li> <li>• The linkage between the rice processing industry and research institutions was not adequate</li> </ul>	<p>has shifted from coarse and medium to fine and aromatic in recent years.</p> <ul style="list-style-type: none"> <li>• Promotion of the high valued rice</li> <li>• Promotion of the organic rice</li> <li>• Value addition and value chain approach</li> <li>• Availability of banking as a source of fund</li> <li>• The by-products of the especially bran which is used in making of edible oil is showing increasing demand over the years. Further all the by-products have the potential to turn into cash/profit</li> <li>• The domestic and export consumers were sensitive and conscious about food quality and thus the use of nutritive premium quality rice is growing at a higher rate</li> <li>• The import of basmati and non-basmati rice had increased gives ample</li> </ul>	<p>under polluting industries due to the dispersion of rice husk ash and liquid effluent generation</p> <ul style="list-style-type: none"> <li>• Unavailability of raw materials round the year</li> <li>• Competition from the players operating in the similar field near to the boarder in India side poses a threat in the short run</li> </ul>
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	<p>all over the country on par with imported machineries.</p> <ul style="list-style-type: none"> <li>• Wide varieties of rice (raw rice, steamed rice, single and double boiled rice) still is not commonly available in the domestic market.</li> </ul>		<p>opportunity for major rice processors to take up value addition activities so as to thrive in domestic and international markets</p>	
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**Intervention strategy of rice in TMC**

**Table 2.** Intervention strategies of rice sub-sector in TMC districts

SN	Weakness/ Opportunities	Challenges	Key intervention- Rice
1	<p>Low productivity; low input use especially fertilizers; lack of inputs on time; high cost of agro-inputs; traditional farming; low financial capacity of farmers to increase farmland and purchase the required inputs; increase in incidence of flooding and drought; increase in crop failure; more incidence of pests and disease occurrences</p>	<p>Poor market regulatory control and standardization of inputs; low financial capacity of the farmers; low national average of quantity of fertilizer available; inadequate funding of research institutions for the development of new high yielding climate smart rice varieties, technologies to mitigate effect of climate change; low level awareness by farmers on production; non-functional extension service</p>	<p><b><i>Increase and sustain the volume of rice production for complete import substitution:</i></b></p> <ol style="list-style-type: none"> <li>1. Soil health management (distribution of soil health card and digitization of soil health data)</li> <li>2. Increase irrigated area with full water control and multiple crops increment</li> <li>3. Enhancing irrigation use efficiency (improvement in farming technology [System of Rice Intensification (SRI), Direct Seeded Rice (DSR)], Alternative Wetting and Drying (AWD).</li> <li>4. Enhancing the production through modern agro-techniques (package of practices with inclusion of organic crop production practices; expansion of rice - Pulse and rice - oil seed area; increasing area under double rice farming; promotion of DSR, conservation agriculture (CA), SRI farming practices; introduction and coverage by climate</li> </ol>

			<p>resilient crop varieties; promotion of early spring rice)</p> <p>5. Organic rice farming practice (Expansion of cultivated area using organic manure, vermi-compost, bio-fertilizers and organic/herbal pesticides)</p> <p>6. Awareness to reduce GHG emission (optimal N usage/Flooding regime) as climate change (CC) mitigation strategy.</p>
2	<p>Availability and use of modern breeding techniques; private sector involvement in seed system; huge gap in seed demand and supply; availability of breeder and foundation seeds of the improved varieties; competitive Nepalese hybrids</p>	<p>Fragmented land holding; indigenous methods of harvesting and threshing; open border system (sometimes many denotified and diseased seeds are imported); indigenous method of seed production and storage; inadequate varietal choice and limited number of breeding lines; climate change and lack of adaption to particular climatic region; demand and supply chain disruptions.</p>	<p><b><i>Seed production and seed systems strengthening</i></b></p> <p>1. Self-sufficient on quality seed production of proper improved varieties</p> <p>2. Quality hybrids at farmers doorstep</p>
3	<p>High level of drudgery for production and processing; misapplication of machinery; inadequate supply of new generation operators/ handlers; destruction of the environment resulting from the wrong application; inadequate tractors, planters, combine harvesters and conditioning machines</p>	<p>High costs of needed machinery and equipment; lack of skilled manpower for the operation and maintenance of the machinery; poor funding of seed development technologies</p>	<p><b><i>Increase access to and use of mechanization equipment and tools in rice production</i></b></p> <p>1. Higher efficiency through mechanization (Reduce drudgery by increased use of machines in rice production &amp; post-harvest operations; support farmer for post-harvest machinery acquisition; train rice farmers on improved postharvest practices to reduced post-harvest losses)</p> <p>2. Reduce inappropriate mechanization</p> <p>3. Improving Postharvest Management System (thresher and threshing floor, drying equipment – spring rice, improve packaging bag) to provide good quality of rice commodity as raw material for rice processing industries</p>

4	<p>Increasing youth involvement in agriculture; development of package of practices (PoP) for most of the varieties; established institutions for the extension</p>	<p>Lack of motivation among the rural youth farmers involvement in agriculture; inadequate number of the extension workers; lack of ICTs tools; low level of need-based extension coverage; ineffective and weak linkages between stakeholders at different levels; low level of education of farmers; insufficient budget and investment for extension activities; domination of supply driven approaches rather than demand driven; inadequate extension services in parts of value addition and market exposure</p>	<p><b><i>Capacity building, empowering and providing assistance for agri-entrepreneurship development</i></b></p> <ol style="list-style-type: none"> <li>1. Reintroduction of training and visit system for extension officials</li> <li>2. Build capacity on GAP for Extension</li> <li>3. Training to farmers</li> <li>4. Training to rural youths on maintenance &amp; operation of machineries and initiate measures that increase youth participation in rice agribusiness</li> <li>6. Strengthening the rice desk of the cereals division of ministry to coordinate policy and outcomes of Govt. and other interventions in the rice sector.</li> </ol>
5	<p>Better seasonal road network; electrification in each ward of terai and inner terai; Insufficient area developed with irrigation structures; around one third of rice farmers can access supplementary water supply for two crop cycles per year; diversified sources of irrigation</p>	<p>Involvement of different ministries; Abandonment of irrigation; policy focused on the development of expensive irrigation system; rapid urbanization and destruction of old irrigation channel</p>	<p><b><i>Build and enhance quality of physical infrastructure</i></b></p> <ol style="list-style-type: none"> <li>1. Farm Road</li> <li>2. Farm electricity supply</li> <li>3. Irrigation development and rehabilitation of existing ones</li> <li>4. Assistance for establishment of Custom Hiring Centers (CHC)</li> <li>5. Assistance for establishment of mini food processing units</li> </ol>
6	<p>Poor post-harvest technologies result in high loss; around two third of farmers do not have access to post-harvest machinery and</p>	<p>Poor rural infrastructure (roads network, poor power supply); limited technical know-how on processing; lack of capacity of farmers to utilize these machineries; high cost of the machinery;</p>	<p><b><i>Upgrade the processing and marketing of rice and rice products</i></b></p> <ol style="list-style-type: none"> <li>1. Facilitate domestic milling capacity and develop storage facilities</li> <li>2. Establish micro and medium processing centres (also used to train</li> </ol>

	<p>services; lack of access to appropriate harvest and post-harvest machinery like rice reapers, rice threshers, simple combine harvesters, dryers, winnowers, etc.; poor/inadequate storage facilities; inadequate pre-cleaning, drying, winnowing, and storage facilities; wastage of milled rice by-products; only small-scale value addition after milled rice is produced; wastage of milled rice by-products; developed ICT sectors</p>	<p>absence of maintenance and repair center; limited access to finance to procure and run post-harvest handling equipment service centers; high interest rate on credit when available; high cost of operation due to power outage, most millers depend on alternative sources of energy like diesel generators, etc., which increases milling costs; disorganized marketing system; lack of ICT in marketing; high cost of package cost</p>	<p>community youth on rice processing and marketing)            3. Promote efficient and environmentally friendly use of rice by-products e.g., Bran and Husk to energy source or briquettes making            4. Increase the utilization of side products and by-products of rice through products diversification and value addition</p>
7	<p>Availability of commercial agricultural credit scheme; small and medium financial institutions; subsidy program of government</p>	<p>The high cost of credit; limited insurance support; collateral issues; financial institutions have difficulty in loan repayment, loan documentation (agreements, Credit guarantee, etc.), and making access to finance by rice farmers difficult</p>	<p><b><i>Improve access to and use of financial services</i></b>            1. Clustering of farmers in production clusters and processing to improve access to market and financial services            2. Expand Agricultural. insurance portfolios of the private insurance companies through government special seed fund support            3. Increase in the local fabrication of simple and cost-effective machines through policy intervention and financial arrangement</p>

**Conclusion**

In this study, the Morang district with 86,634 ha was found to have the highest area of rice within TMC boundary in the fiscal year 2019/20. Similarly, Jhapa district was found to have the highest production (373,732 MT) and yield (4,403 kg/ha) of rice in the same fiscal year. Within a period of 20 years, it was discovered that the annual growth rates for rice production and area in TMC were found 27,913 MT and 4,371 ha (in negative direction) respectively. The growth rate of area of a rice was found to have ‘declining trend’, while the growth rate of rice production was found to have an ‘increasing trend’ within TMC. The

average annual growth rate in the yield of rice in TMC and the national level was found to have ‘increasing trend’ but the average annual rice yield (kg/ha) growth rate in the TMC was found comparatively higher than that at the national level in the period from 2000/01 to 2019/20. The SWOT analysis of the rice sector showed the need of strengthening the rice inputs, production, marketing and processing and value addition strategies. Therefore, the Government of Nepal (GON) should develop a new land use policy or amend the existing policy to prevent the downward trend in the growth rate of rice cultivation area. Similarly, innovative and techno friendly strategies should be adopted to boost up rice input, production, marketing, processing and value addition activities in order to maintain the sustainable food security in the country.

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