

Rice commodity development strategy for the 12th Five year plan

Rationale

Rice is the most important cereal crop of Bhutan and it plays a very critical role in both household and national food security. It is the most preferred staple that is consumed three times a day. In terms of calorific value, rice constitutes 53% of the daily dietary energy requirement of Bhutanese (Chettri et al., 2015). The rice availability and its supply in the market are important for both household and national food security. However, production data of agriculture statistics 2016 shows that the country is just 47% self-sufficient in rice at a per capita consumption of 140 kg (DoA, 2016). Rest of the rice requirement is met through import, mostly from India.

Over the last few years, Bhutan has been able to make tremendous strides in rice research and development. Production data of the last 10 years show that there is an increasing trend in terms of both production and productivity. This is attributed to various technical interventions such as improvement in cultivation practices and promotion of improved varieties. Currently, Bhutan grows rice in an area of 53,055 acres and its production stands at 85,090 MT with the average productivity of 1.68 MT per acre (DoA, 2016).

Despite increased investment and efforts thus far, rice import has been rising and the cultivation area is decreasing. Data with the Ministry of trade show that the country imported 83,646 MT of rice in 2015 which is worth Nu. 1,668.14 million. This is a serious concern for the country as this would mean high dependency on import and depletion of Rupee reserve leading to serious trade imbalance.

Taking stock of the current situation and external factors, the Department's target for the 12th Five Year Plan is to enhance domestic rice production from the baseline 80,797 MT to 98,215 MT to achieve 60% self-sufficiency. This is an increase of about 22% which is roughly 17,418 MT of additional rough rice from the current production. At current yield level, achieving this target would mean bringing additional area of more than 13,000 acres under cultivation, including land development and terracing. Achieving 22% increase in production is already a huge challenge requiring substantial investment.

Target and Objective

The Department's target for the 12 FYP is to achieve 60% rice self-sufficiency. To achieve this target, the national rice programme has developed a holistic strategy with the following objectives:

1. To increase rice production from 80,797 to 98,215 MT by improving productivity and production practices and bringing fallow rice area under cultivation.
2. To increase profitability of rice farmers through improved rice value chain, post production interventions and domestic marketing.

While 60% rice-self sufficiency is achievable with enhanced investment and strategic interventions including policy support, 100% self-sufficiency is not possible given the challenges and issues in rice farming. The following are the reasons as to why 100% target is not achievable:

1. Potential lands are increasingly getting fallowed, water sources are drying out and precipitation has become highly erratic, thus increasing constraints to production.
2. While lands are getting fallowed and rural-urban migration increases, Bhutan would require a total rice area of 112, 882.97 acres to reach projected rough rice production of 181, 042.59MT to achieve 100% self-sufficiency rate (Figure 1).

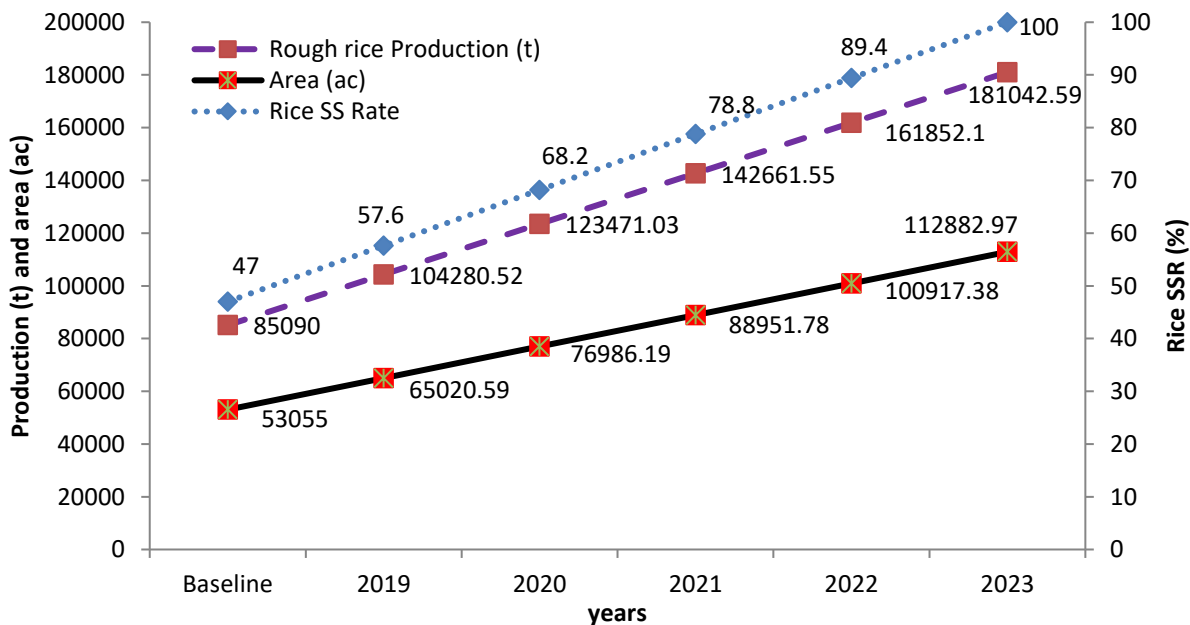


Figure 1. Projection of rice production and area for 100% self-sufficiency

3. For 100% Rice Self- Sufficiency, we would require additional 59,828 acres which is not at all possible given the topography and available land. Moreover, even if all the fallow land of 6,402 acres (DoA, 2016) is utilized, it will not be adequate to achieve the target. Converting existing dry land into wet land is not possible due to lack of water sources, competition from other high value crops and opportunity costs.
4. Rice farming is highly labour intensive and labour shortage is number one farming constraint (DOA, 2016, DoA 2015)
5. Bhutan does not have comparative advantage in rice cultivation due to high cost of production, mountainous terrain, high labour and transportation costs. Access to cheap imported rice also further discourages farmers to take up rice cultivation.

Constraints, challenges and issues

Rice farming is challenged by many constraints which are both controllable and non-controllable. The following are the lists of constraints; challenges and issues categorized under three separate headings:

A. Those within our control

1. Crop loss to wild animals: It is the number one issue reported by farmers.
2. Production related
 - a. Irrigation: More than 50% of the total wetland is rainfed and for increasing yield, more investment in irrigation will have to be ensured.
 - b. Soil fertility: Farmers do not apply adequate fertilizers to exploit the yield potential of improved varieties.
 - c. Pests and diseases: There are more insect and disease problems in the hot and humid low altitude southern rice belt. Moreover, substantial yield loss occurs from weeds in all the rice environments.
 - d. Land: topography and highly fragmented land pose a huge challenge
 - e. Mechanization: limited scope for mechanization
 - f. Technology adoption: Low adoption by farmers

3. Market related

- a. High cost of production due to several factors such as over head costs of inputs, labour costs and subsistence level of production
- b. Low incentive: Absence/low incentives to promote marketing of rice
- c. Free rice trade: Availability of cheap imported rice discourages farmers to take up rice farming

B. Those beyond our control

1. Changing climate: Rice farming is challenged by erratic pattern of rainfall, drought conditions, and cold stress in higher elevations.
2. Natural disasters: such as flash floods, wind/rain storm, landslides annually destroy crops and potential farm lands in almost all the rice growing dzongkhags.
3. Fallowing of land due to rural-urban migration, farm labour shortage and predation by wild animals is on the rise.

C. Policy related

1. Availability of cheap imported rice discourages rice farming thus making rice farming unattractive
2. Subsidy/incentive for farmers are negligible thus rice farming become unattractive
3. Wet land conversion to other land use and urbanization: This requires some policy interventions and strict application of existing laws (Land Act) since rice is not economical as compared to other crops.

Opportunities

While rice production is beset with numerous issues and challenges, there are opportunities which could transform rice industry in the country. If enhanced investment and technical interventions are made, the following opportunities exist:

1. Enhance the current rice productivity and production levels
2. Bridging yield gap between research and farmers' fields through enhanced use of HYVs and improved nutrient management practices

3. Mechanization to reduce drudgery and cost of production in about 20% of the rice areas. Commercialization, value addition and product development (commercial rice products like cakes, properly packed zaws, etc. including products like parboiled rice, local premium rice) offer opportunity.
4. Export of red and premium local varieties as organic brands for both international and regional markets.

Strategies

In order to achieve the Department's target of 60% rice self-sufficiency in the 12FYP, the rice program aims for both vertical and horizontal expansion. With investment in large irrigation schemes and technical interventions, it is possible to bring about 15% vertical increase in yield from the current cultivated rice area which would contribute 12,296 MT additional rough rice. The rest (7%) could come from horizontal expansion of land through cultivation of 3201 acre fallow land (50% of fallow land) at the current yield level. Additional production is also envisaged from Spring rice cultivation. About 17,000 additional rough rice is required to reach target of 98,215 MT as detailed in Table 1 below.

Table 1. Analysis of production increases to achieve 12 FYP target

Particulars	% increase	Area increase (Acre)	Production increase (MT)	Remarks
Vertical increase	15%	0	12296	Increasing yield to 1.84 t/ac over current production on the current area
Horizontal expansion	7%	3201	5122	50% of fallow land brought under cultivation @current yield of 1.6 t/ac
Total	22%	3201	17418	80797+17418=98, 215 MT

The 12 FYP strategies for national rice program are discussed as follows:

1. Land development

To bring about increased labour and input use efficiencies and horizontal expansion of production area, there is a need to improve our existing terraces by widening and removal of surface stones. While this will facilitate use of farm machineries, there is also need to improve access to efficient and better machineries. As part of land development, the internal road networks will have to be improved for the movement of farm equipment and machineries.

For this the 12FYP target spread across the dzongkhags is about 2000 acre. Since the country is also losing potential rice paddies to conversions, the Dzongkhags will have to go for construction of new terraces wherever possible targeting 2000 acres.

2. Farm mechanisation

Farm mechanization is one of the most important interventions that will reduce drudgery of rice farming besides reducing cost of production. It will also bring about increased efficiency, thus contributing to increased productivity and yield. As part of promoting farm mechanization, Farm machinery Corporation Limited (FMCL) will be providing machinery hiring services. Additionally, geogs will also continue to provide hiring services supported by FMCL in technical matters. To improve mechanization services, the government will have to provide additional fleet of machineries while also encouraging private machinery services towards achieving mechanization target of additional 10, 000 ac in the 12th FYP. For improved services in the wake of limited machineries, machinery hiring services will have to be provided in strategic locations and thereafter scale up in more locations.

AMC will continue research and development on tools and equipments.

3. Production support

To bring about increased crop production, following support will be crucial, and accordingly there should be sufficient fund allocation backed up by policy guidelines.

- a. **Irrigation development:** In rice farming, irrigation is the most important input requiring higher levels of investment. Currently, area under assured irrigation is

just about 40% and by the end of 12FYP, about 75% of rice fields should receive assured irrigation. As per the DoA's irrigation master plan for the plan period, there are 29 large schemes requiring about 400 M budget in addition to those existing irrigation channels that need to be renovated at regular interval of time.

- b. **Promotion of improved varieties and quality seed:** In order to bring enhanced productivity and production, use of improved varieties must be increased. For this, HYVs will have to be aggressively promoted and adoption rate will have to be increased to at least about 60% from the current 40%. Currently, seed quality is also a concern and in the 12FYP, we need to revamp seed system with increased capacity to produce quality seed.
- c. **Soil fertility:** Improving soil fertility is one most important aspect of modern farming. For increased yield, nutrient management/fertilizer should receive top priority. More so when we use improved seeds to gainfully exploit genetic potential of improved varieties. Since most farmers do not use inorganic fertilizers, they should at least be encouraged to supplement their organic inputs with NPK for increasing the yield. Fertilizer supplement with at least one urea top dress should be made available if we are to achieve 15% vertical increase in production. Access to fertilizers should be improved.
- d. **Integrated Pest Management (IPM):** is another most important area that will contribute to sustained production. While the country advocates on organic production and IPM technologies, herbicide use in rice farming is critically important given the farm labour shortage. Bhutanese farmers use granular form of butachlor which is bulky and increases transportation costs. Therefore, like in other rice growing countries, DoA will have to promote use of alternative and more effective herbicides which come in liquid formulations (emulsified concentrates). This will be more effective while also reducing transportation and overall cost of the herbicides. Other areas to look at are intensification of surveillance and pest forecast system initiated by National Plant Protection Centre (NPPC). This will reduce crop loss to pests and vagaries of weather and climatic conditions.
- e. **Post harvest services:** All pre-harvest technical initiatives would go to waste if post-production services are not provided. Post harvest strategies include

encouraging use of motorized improved milling machineries, promoting use of power threshers, promoting use of grain drying technologies including value addition and improvement in production development. Access to post harvest machineries must be ensured while product development and value addition will have to be given some level of urgency. AMC should continue testing and standardization of machineries together with line agencies.

- i. Encourage use of improved motorized milling machines
- ii. Promote use of power threshers(AMC)
- iii. Grain drying technology promotion (spring rice)

4. Cultivation of fallow land

According to DoA statistics (DoA, 2016), 6402 acres of potential wetlands are left fallow across the country. Just by bringing 50% of such land under cultivation would bring additional rice area to 3,201 acres which, at current yield level would give 5,122 MT of rough rice. In order to make this happen, many larger irrigation schemes are in pipeline and farmers must be provided all production support in the form of seeds, electric fencings, land development and accessibility to machineries through hiring services.

For cultivation of fallow land, the government should also have a policy in place to encourage contract and corporate farming. Beginnings have already been made with the creation of FMCI, but there are opportunities for other well established corporations and private companies to take up rice farming and related business enterprises. Also, together with the local government, the Ministry should also thoroughly assess the fallow land system in order to come up with relevant strategies for brining uncultivated land back to cultivation.

5. Crop Commercialization

Rice, being the number one crop for Bhutan, there is a huge potential for commercialization. The total volume of domestic rice that enters formal marketing system is less than 1% of the total production (Chhogyel et al., 2015) and the total rice that Bhutan's informal market is about 26% of the total production. Therefore, there is opportunity to drastically increase circulation of domestically produced rice through commercialization and improved value chain. This will also

contribute to increased production by encouraging farmers to produce rice considering its profitability and efficiency in marketing system. For this to happen, firstly, processing facilities will have to be established in potential areas backed by marketing support through appropriate price support system since locally produced rice are expensive.

Considering the huge potential for organic and premium red rice, we should also initiate development of processing and marketing facilities in selected areas. This way, we can bring about some changes in commercialization of rice. For instance, our local premium varieties such as Khamtey, Choeti, Attey, Tan Tsheri, Bondey and Sung sung bara should enter formalized marketing system with sufficient dividend to the farmers through price support and establishment of processing facilities.

6. Crop intensification

One of the very important strategies of enhancing rice production is through crop intensification. While much of the rice areas in the northern part of the country do not permit two crops of rice a year, southern belt and mid-altitude (with 1200 m elevation) dzongkhags have potential for rice-rice cropping system. Unlike the main season crop, rice-rice cropping (double cropping) could be encouraged by strategically supporting the farmers through provision of inputs and machineries.

Other than rice double cropping, crop could be intensified by bringing additional area under upland rice. Where possible, upland has to be encouraged and supported since it is also very important from the view point of climate change and bio-physical stresses. We can target at least about 1000 acres additional upland rice for the 12FYP. Further, rice intensification could be enhanced through promotion of direct seeded rice technology. This is important from the view point of farm labour shortage and impacts of climate change.

7. Policy recommendation

To support the rice commodity development strategies, the following policy recommendations are made.

1. Develop/implement land reforms: While Land Act 2007 protects wetland, there is a need to work towards better land reforms considering land swapping, fragmentation, and land development issues.

2. Subsidy for inputs: Support to incentivize rice farming would be very much required specifically for critical inputs like fertilizers, machineries and improved seeds.
3. Implement chuzhing Protection policy: While there is a law to protect chuzhing, its implementation has become an issue, thus contributing to loss of potential lands to urban development and conversions.
4. Contract/corporate farming: To encourage commercialization, there should be a policy on contract and corporate farming.
5. Policy for imported labour in agriculture: As importation of labour is permitted for non-agricultural works, it should be possible also in farming during the peak seasons (regulated labour during peak seasons).

Research support for commodity development

Research should be the cornerstone of development strategies and therefore should go hand in hand. In order to support rice commodity development initiatives, the research system should contribute in the following ways:

1. Crop Variety development with focus on stress tolerance, maturity duration, eating quality, nutrition and health issues. For stress tolerance, major focus should be on the development of drought and cold tolerance, resistance against pests and diseases. While focus is made on eating qualities of rice, it is equally important to have bio-fortified and low GI varieties for health reasons.
2. Nutrient Profiling and characterization of all traditional varieties should be done in order to have clear picture of our genetic resources for future breeding and variety development programmes.
3. To promote sustainable rice farming, research centres should continue to work on integrated nutrient and integrated pest management systems. This will involve testing of technologies, or their combinations in combating issues in cropping systems. This would include organic and inorganic researches to solve problems related to soil, diseases resistance, weed control and yield improvement.
4. Climate change impact studies including review of rice in different agro-ecosystems should be done. Since climate change is reported to affect rice farming the most, it is important to

generate data and evidence of climate change on irrigation/water sources, farming system changes, cropping pattern and coping mechanisms across the country. Studies on climate change and productivity modelling with real time data would be very relevant including use of satellite and remote sensing technologies.

Investment analysis

Required investment is projected in the table below.

INVESTMENT REQUIRED for 5 years	Nu. In Million
Research	50
Seeds	25
Demonstration and promotion	5
Land development - consolidation	150
Land development - New terrace	150
Irrigation (according to 12th plan target)	500
Minor maintenance of irrigation channels	150
Subsidy for fertilizer and chemical	29.638
Subsidy for mechanization	118.552
Post harvest	59.276
Marketing (price support)	250
	1487.466
Investment per year	297.4932