



RESEARCH ARTICLE

PRESENT STATUS OF GRAIN LEGUMES PRODUCTION IN NEPAL

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ABSTRACT

This paper is prepared to know the information about the present scenario of grain legumes in Nepal. Grain legumes are important crops for improving soil condition and dietary status of human. The area, production and productivity of grain legumes are collected from the data which is published by the Ministry of Agriculture and Livestock Development (MoALD). During the fiscal year 2019/20, Grain legumes are grown in 333,740 ha with the production and productivity of 381,987 Mt and 1,151 kg/ha respectively. Among pulses, the winter crop lentil dominates in production (65.76%) as well as in area coverage (62.93%). Grain Legumes Research Program (GLRP) of Nepal in collaboration with the Consultative Group on International Agricultural Research (CGAIR) centres works for genetic improvement of lentil, chickpea, pigeon pea, soybean, black gram, fababean and cowpea.

KEYWORDS

Agriculture, Grain legumes, Nepal, constraints, management.

1. INTRODUCTION

Agriculture is still the largest economic sector that solely contributes 27% of National Gross Domestic Product (GDP) during the fiscal year 2018/19 (MoF, 2019) and 65% of the total population still depends on agriculture in Nepal (MoALD, 2019). Nepal has diverse agro-ecology that permits different agricultural systems and production of different crops especially grain legumes. Grain legumes are an integral part of Nepalese agricultural systems. They are the staple food and contribute major share in area and production. Grain legumes are also called Pulses, are crops of the legume family (Fabaceae) cultivated specifically for their seeds for human food and animal feed. The term "Pulses" is limited to crops harvested solely for dry grain, thereby excluding crops harvested green for food, which is classified as vegetable crops, as well as those crops used mainly for oil extraction and leguminous crops that are used exclusively for sowing purposes (FAO). It includes lentil, beans, peas, peanuts, black gram etc. They are important in terms of nutrition and subsistence farming. It plays a role in enhancing the soil fertility by symbiotic fixation.

They supply the major part of the dietary protein (20-25 % protein by weight, which is 2-3 times that of wheat and rice) for the majority of poor who cannot afford expensive animal protein and vegetarians (FAO, 2019). Legumes are an important component of Nepalese farming systems and diets. Blackgram, lentil, chickpea, cowpea, field pea, horse gram, mung bean, pigeon pea, and soybean are commonly grown grain legumes in Nepal. The total pulse production during the fiscal year, 2018/19 is 0.4 million MT in Nepal (MoALD, 2019). Among them, lentil alone contributes more than 67% of total pulse production and it is also the sole export item

of the country (FAOSTAT, 2019). Grain Legumes Research Program (GLRP) of Nepal in collaboration with the Consultative Group on International Agricultural Research (CGAIR) centres works for genetic improvement of lentil, chickpea, pigeon pea, soybean, mung bean, black gram, grass pea, fababean and cowpea.

2. OBJECTIVES

The main aim of the present paper is:

- To characterize the utilization of grain legumes
- To know the present status of grain legumes production and productivity in Nepal
- To find out the causes of low production
- To know the mitigation strategies to increase the production of grain legumes in Nepal

3. METHODOLOGY

The present paper is based on review and secondary data. The review focused primarily on literature search and restricted to articles and report papers published between 2010 and 2019. Similarly, secondary data is collected from different journals, annual reports of the Ministry of Agriculture Development (MoAD), Nepal Agricultural Research Council (NARC) and Development of Agriculture (DOA). The data of area, production and productivity of grain legumes in Nepal is collected from Ministry of Agriculture and Livestock Development (MoALD).

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4. RESULTS AND DISCUSSIONS

4.1 Importance

Grain legumes play an important nutritional role in the diet of millions of people in the developing countries and thus sometimes referred to as the poor man's meat (Nedumaran et al., 2015). They are very important crops in Nepal in terms of their contribution to human and animal nutrition, as components of indigenous cropping systems, and restorers of soil fertility. It play a crucial role in the sustainability of agricultural systems. They are the vital sources of protein, calcium, iron, phosphorus and other minerals. Grain legumes, such as Lentil, are high in dietary fiber, antioxidants and phytoestrogens and can be sold to generate income. Forage legumes, such as alfalfa, can be used on the farm to feed livestock. In addition, legumes have functions such as soil fertility improvement through biological nitrogen fixation (BNF), soil erosion control, source of fuel and a range of other benefits (Muoni et al., 2019). In agricultural systems, grain legumes are potential sources of plant nutrients that can complement and/or supplement inorganic fertilizers for cereals crops. This is due to their ability to fix biological nitrogen and indirect supply manure-based nitrogen inputs when included in the cropping systems as inter-cropping and crop rotation (Snapp et al. 2018).

4.2 Area, Production and Yield

In the present context of Nepal (2018/19), Grain legumes are grown in 333,740 ha with the production and productivity of 381,987 Mt and 1,151 Kg/ha respectively (MoALD, 2019). Highly diverse climatic and environmental conditions in the country allow cultivation of at least one dozen species of grain legumes in Nepal. Lentil, black gram, cowpea, soybean, grass pea, mungbean are the major grain legumes cultivated in Nepal. Among them, Lentil is the first important legume crops in terms of area and production in the country. Table 1 presents the area, production and productivity of the yield of various kinds of grain legumes cultivated in 2018/19.

Table 1: Area, production and yield of grain legumes in Nepal (2018/19)

LEGUMES	AREA (Ha)	PRODUCTION (Mt)	YIELD (Kg/Ha)
Lentil	208,766	251,185	1,203
Chickpea	9,653	10,675	1,106
Pigeonpea	16,753	16,538	987
Blackgram	23,492	19,928	848
Grasspea	7,952	9,329	1,173
Horsegram	6,119	5,754	940
Soybean	25,179	31,567	1,254
Others (fieldpea, cowpea, mungbean)	33,826	37,011	1,094
TOTAL	331,740	381,987	1,151

Source: MoALD 2020. Statistical Information on Nepalese Agriculture (2018/19).

Majority of grain legumes area and production is confined to terai and inner terai and winter legumes contribute the major share in area and production. Among grain legumes, the winter crop lentil dominants in production (65.76%) as well as in area coverage (62.93%). Nepal has great potential to produce different grain legumes species because of its diverse agro-ecological environment. And farmers are growing different species of grain legumes depending upon their agro-ecological conditions and cropping systems. Based on their seasons of cultivation, grain legumes are classified into two categories and they are Summer season legumes and Winter seasons legumes.

Summer Season Legumes	Winter Season Legumes
Blackgram (<i>Vigna munga</i>)	Lentil (<i>Lens culinaris</i>)
Soybean (<i>Glycine max</i>)	Chickpea (<i>Cicer arietinum</i>)
Cowpea (<i>Vigna unguiculata</i>)	Grasspea (<i>Lathyrus sativus</i>)
Horsegram (<i>Macrotyloma uniflorum</i>)	Fababean (<i>Vicia faba</i>)
Pigeonpea (<i>Cajanus cajan</i>)	Fieldpea (<i>Pisum sativum L.</i>)

Source: Nepal Agriculture Research Council (NARC) (Pokharel et al., 2019).

Diverse agroclimatic conditions ranging from warm subtropical to temperate allow Nepal to grow many grain legumes. The brief accounts of the important grain legumes grown at varied agro-ecological zones in Nepal are:

4.2.1 Lentil (*Lens culinaris*)

It is one of the most commonly consumed legumes and is important as an export commodity. Lentil is a rich source of protein (22-28%) and high micronutrients such as iron (Fe), zinc (Zn) and selenium (Se), which are important for increasing immunity and maintaining health metabolism and diet (Darai et al., 2018). Lentil production is generally confined to inner and outer terai, but it is grown mainly in the cool/winter season and accounts for 63% of total pulse area (0.33 million ha) and 67% of total pulse production (0.4 million MT). The national average lentil yield is 1.2 Mt/ha (MoALD, 2019).

4.2.2 Soybean (*Glycine max*)

Soybean cultivation, formerly limited to the mid-hills, is now extending to inner and outer terai. In Nepal, it is grown in 25,179 ha with production and productivity of 31,567 Mt and 1,254 kg/ha respectively (MoALD, 2018/19). Soybean seed contains high protein (40-45%), 20% oil and rich in vitamin B, C, E and minerals (Thapa et al., 2014). Soybean has a very diverse utilization as the seed is used to prepare baby food and food for diabetic patients, green pods are used as green vegetables and dry seeds roasted or fried eaten as snacks. Soybean oil is cholesterol-free, widely used for cooking and in the production of vegetable ghee. Similarly, green foliage can be used as green manure and as a fodder crop. In recent years, small industries have set up to convert soybean into soymilk, soybean curd and other products.

4.2.3 Chickpea (*Cicer arietinum*)

Chickpea is a very drought-tolerant, nitrogen-fixing, cool-season crop that tolerates heat during fruiting and ripening. It is extensively cultivated in the Terai districts. In hilly areas, its cultivation is limited to certain warmer areas. It contains a range of nutrients, including protein, which is necessary for bone, muscle and skin health. Its seed is a good source of protein (18-22%), carbohydrate (52-70%), fat (4-10%), minerals (calcium, phosphorus, iron) and vitamins. Its straw has also good forage value. In Nepal, it is grown in 9,653 ha with 10,675 Mt Production and yield of 1,106 kg/ha (MoALD, 2019).

4.2.4 Fababean (*Vicia faba*)

It is mainly grown in warm places in Nepal. Fababean is the minor grain legumes. Fababean is a good source of mineral nutrients, vitamins and numerous bioactive compounds. Equally important is the contribution of fababean in maintaining the sustainability of agricultural systems, as it is highly efficient in the symbiotic fixation of atmospheric nitrogen.

4.2.5 Mungbean (*Vigna radiata*)

Mungbean is considered as the most digestible among other pulses and its soup is widely used as a healthy diet. Fried mungbean is popular as snack. Its cultivation is limited to certain areas in the terai. Improved mungbean varieties introduced from India are being cultivated by farmers in Nepal (NGLRP, 2019).

4.2.6 Blackgram (*Vigna munga*)

Blackgram has a wide range of availability and in Nepal, it is grown from 100 to 1,900 meters above the sea level. It is the most important summer legumes grown in Nepal. And in the context of Nepal, it is cultivated in an area of 23,492 ha with the production and productivity of 19,928 Mt and 848 kg/ha respectively (MoALD, 2019). It fixes atmospheric nitrogen to the soil through symbiosis and improves the fertility of the soil. It is consumed in the form of dhal. Black gram dhal produced in the hills of Nepal is considered to have better cooking quality.

4.2.7 Grasspea (*Lathyrus sativus*)

Grasspea cultivation is confined to inner and outer terai. It is popular with

the farmers, since it can be grown under low fertility conditions without irrigation and tillage. It is an annual, vining or climbing, drought-tolerant, nitrogen-fixing plant up to 1m in height. In Nepal, it is grown in 7,952 ha with production of 9,329 Mt and productivity of 1.2 Mt/ha (MoALD, 2019). It is a multipurpose grain legume, the seeds of non-toxic forms used for human consumption, and the plant used for forage.

4.2.8 Cowpea (*Vigna unguiculata*)

Its area and production are in increasing trend. It is one of the important summer grain legumes of Nepal and is grown in marginal land with little or no inputs. Cowpea is planted as a sole crop as well as inter/mixed crop maize. It is being grown in for Terai to mid hills for various purposes such as vegetables, dhal and green manuring.

4.2.9 Groundnut (*Arachis hypogaea*)

Groundnut is the most important income-generating summer oilseed legume crops of Nepal. It is used both for oil and confectionary purposes. The area under groundnut is estimated to be 15000 ha (MoALD, 2019) and the trend is increasing due to the development of high yielding varieties, adoption of improved technologies and spreading its cultivation in new areas of western hills. National oilseed research program (NORP) and ICRISAT is jointly working for identifying the suitable genotypes for spring planting and explore the potential of inter or mixed cropping with cereals (MoALD 2020. AICC).

4.2.10 Pigeonpea (*Cajanus cajan*)

It is one of the most important summer legumes crops in Nepal. It is cultivated in the area of 16,753 ha with 16,538 Mt of production and 987 Kg/ha yield (MoALD, 2019). Pigeonpea is a nitrogen-fixing, perennial shrub, growing to 4m in height, that produce green or dry seed in seasonally dry climates. It is adaptable to many soil types and is used as dry pea, green vegetable, fodder, green manure or cover crop.

4.2.11 Horsegram (*Macrotyloma uniflorum*)

Horsegram is a variety of lentil and has significant value to hillside Nepalese farmers, which hold the potential for export to Canada. In Nepal, it is generally grown in the hilly area. In 2018/19, in Nepal, it is grown in 6,119 ha with production and productivity of 5,754 Mt and 0.94 Mt/ ha respectively (MoALD, 2019). It is rich in polyphenols, and have elevated levels of antioxidants. It is a good source of protein and contains an adequate amount of calcium.

4.3 Constraints

Grain legumes are affected by diverse biotic and abiotic stresses severely limiting its productivity. And farmers are reluctant to grow grain legumes in Nepal due to following reasons:

4.4 Biotic constraints

- High chances of diseases like yellow mosaic virus in soybean, mungbean, blackgram and cowpea.
- Wilt/root rot in lentil, chickpea and pigeonpea
- Leaf spot in soybean, mungbean
- Powdery mildew in mung bean, black gram, pigeon pea
- Incidence of insects like pod borer, aphids and storage beetles
- Unwanted weeds like *Vicia spp.*, *Chenopodium spp.*, *Cyprus rotundus*, *Cynodon dactylon* constitute a major problem.

4.5 Physical constraints

- Acidity/Salinity of soil
- Excess soil moisture and humidity
- Global warming and climate change
- High risk in production due to severe drought
- Terminal heat
- Micronutrient deficiency
- Poor soil fertility
- Lack of awareness among farmers in improved technology in the

production of grain legumes

- Crops grown in poor marginal land

4.6 Socio-economic constraints

- Low priority in National policy
- Lack of mechanization
- Lack of technical knowledge to the farmers about the production packages of grain legumes
- Unavailability of quality seeds
- Lack of input responsive varieties
- Lack of availability of bio-fertilizers at farm level
- Lack of marketing
- Fluctuation in the market price
- Lack of support price and crop loss insurance for commercial farmers.

4.7 Measures to increase in the production of grain legumes

Due to the high range of altitudes and temperature throughout the country, agriculture in Nepal has peculiar characteristics. But there is high fluctuation in area and production of grain legumes in Nepal in recent years. To increase adoption of grain legumes, improved varieties that are drought and heat-stress tolerant, nutrient-dense and high yielding should be made available. Similarly, National Grain Legumes Research Program (NGLRP) under Nepal Agricultural Research Council (NARC) has mandate to generate suitable technologies for increasing the production and productivity of major grain legumes crops in different agro-ecological zones of the country. The following measures should be taken to improve the production and productivity of grain legumes in Nepal are:

- Provide agro-training for farmers
- Establish more agro-based industries
- Collect evaluate and select suitable varieties from local materials
- Development of varieties with determinant growth habit and higher yield potential
- Introduce land reform for a democratic distribution and scientific cultivation of land
- Identify the source of resistance for major diseases and pests of major legumes
- Develop appropriate low-cost technology for higher yield
- Streamlining community-based seed production
- Determine the economic/action threshold level for sustainable development
- Addressing climate change issues and policy reforms for the promotion of grain legumes in Nepal
- Extension of high impact crop management technologies
- Standardize the foliar spray of urea for balanced nutrition
- Develop suitable technology for stress environment
- Improve methodologies and tools for genetic improvement (pre-breeding, advanced biometry, international crop information systems etc).

5. CONCLUSION

Grain legumes are a popular food consumed all over the world and are widely known for their contribution to protein intake in the human diet. Legumes hold vital importance in improving food and nutritional security, generation of income, soil fertility improvement, providing livestock feed, soil erosion control and water conservation, and a source of fuel. Even though grain legumes are critical to smallholder livelihoods in the country, there is lower in the production of grain legumes in Nepal than its potential. Low input usage, limited usage of modern agronomic practices, market problems and poor extension services are the major constraints for low production and productivity. However, Nepal has still different opportunities for enhancing the productivity of legumes including varied agro-ecology, diversity of grain legumes, and increase demand for animal feed and processed foods. Therefore there should be a policy to strengthen, promote and create positive awareness and implementation of grain production technologies.

REFERENCES

- MoALD. 2020. Statistical Information on Nepalese Agriculture 2018/19. Retrieved November 2020, from the Ministry of Agriculture and Livestock Development, Government of Nepal.
- FAO. 2017. FAO/IN FOODS Food Composition Database for Biodiversity Version 4.0- BioFoodComp4.0. Rome, Italy.
- Pokhrel, A., Aryal, L., Poudel, P. 2019. A Review on Research Work of Grain Legumes Research Program, NARC. Kathmandu, Nepal. (https://www.researchgate.net/publication/331311104_A_Review_of_Research_Work_of_Grain_Legumes_Research_Program_NARC)
- Gharti, D.B., Subedi, S., Kumar, S., 2014. Grain Legumes in Nepal: Present Scenario and Future Prospects. World Journal of Agriculture and Research. (https://www.researchgate.net/publication/285815919_Grain_Legumes_in_Nepal_Present_Scenario_and_Future_Prospects)
- Darai, R., 2018. National Workshop and Expert Elicitation on Lentil Productivity in Nepal. CIMMYT. (<https://repository.cimmyt.org/bitstream/handle/10883/20055/60151.pdf?sequence=1>)
- Rajbhandari, B.P., 2011. Grain Legumes of Nepal. Kathmandu, Nepal. (https://www.academia.edu/12017523/GRAIN_LEGUMES_OF_NEPAL)
- Reckling, M., 2018. Grain legumes yields are as stable as other spring crops in long- term experiments across northern Europe. Agronomy for Sustainable Development. (<https://link.springer.com/article/10.1007/s13593-018-0541-3#citeas>)
- Shrestha, R., Neupane, R.K., Adhikari, N.P., 2011. Status and Future Prospects of Pulses in Nepal. Regional Workshop on Pulse Production held at Nepal Agricultural Research Council (NARC), Kathmandu, Nepal.
- Chaulagai, T.R., 2014. Review of sustainability of average Nepalese subsistence farm in mid-hills of Nepal. Journal of Agriculture and Environment. (<https://www.nepjol.info/index.php/AEI/article/view/19832>)
- Morel, M., 2012. Legumes Crops, Importance and Use of Bacterial Inoculation to Increase Production. (<https://www.semanticscholar.org/paper/Legume-Crops%2C-Importance-and-Use-of-Bacterial-to-Morel-Bra%2C%2B1a/364f9da44c6f5f550ab221acf0f77d068ead6dbc>)
- Jensen, E.S., Peoples, M.B., Boddey, R.M., 2012. Legumes for mitigation of climate change and the provision of feedstock for biofuels and biorefineries. A review. (<https://link.springer.com/article/10.1007%2Fs13593-011-0056-7#citeas>)
- Chibarabada, T.P., 2017. Expounding the Value of Grain Legumes in the Semi- Arid Tropics. (<https://www.mdpi.com/2071-1050/9/1/60/htm>)
- Stagnari, F., 2017. Multiple benefits of legumes for agriculture sustainability: an overview. Chemical and Biological Technologies in Agriculture. (<https://link.springer.com/article/10.1186/s40538-016-0085-1#citeas>)
- Nedumaran, S., 2015. Grain Legumes Production, Consumption and Trade Trends in Developing Countries. (<https://www.semanticscholar.org/paper/Grain-Legumes-Production%2C-Consumption-and-Trade-in-Nedumaran-Abinaya/889a17a5d8be8843b6185df0409ae36c03e8084f>)
- Neupane, B.P., 2015. Scenario of Entomological Research in Legumes Crops In Nepal. International Journal of Applied Sciences and Biotechnology. (<https://www.nepjol.info/index.php/IJASBT/article/view/13217>)
- Siddique, K.H.M., Johansen, C., Turner, N.C., 2012. Innovations in agronomy for food legumes. A review. Agronomy for Sustainable Development. (<https://link.springer.com/article/10.1007/s13593-011-0021-5#citeas>)
- Neupane, R., 2017. Food Legumes: Diversity, Utilization and Conservation Status. Conservation and Utilisation of Agricultural Plant Genetic Resources in Nepal. (https://www.researchgate.net/publication/320532256_Food_Legumes_Diversity_Utilization_and_Conservation_Status)
- Darai, R., Sarker, A., 2020. Challenges, Cropping Strategies and Potential Grain Legumes and Cereal Crops for Dry Land Rain Fed Agriculture in Nepal. Journal of Agriculture and Forest Meteorology Research. (https://www.researchgate.net/publication/340455091_Challenges_Cropping_Strategies_and_Potential_Grain_Legume_and_Cereal_Crops_for_Dry_Land_Rain_Fed_Agriculture_in_Nepal)
- MoF. 2019. Economic Survey Fiscal Year 2011/12. Ministry of Finance, Government of Nepal.

