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## Multiple factors lead to Increasing trends in Royal Quinoa *Ashi Heychum* (*Chenopodium quinoa* Willd) Production in eastern Bhutan: A case of enabling climate resilience through livelihood enhancement

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Improving the nutritive quality of grains can help reduce the challenges in food security and climate change impacts. Quinoa – *Chenopodium quinoa* Willd offers an alternative option to those countries suffering from food insecurity and food shortage. In Bhutan, *Chenopodium album* is widely found as a weed while a wild type is said to be cultivated in backyards in remote villages in east and central Bhutan but its identification is not yet clear<sup>i</sup>. The proper cultivation of known quinoa varieties began only in 2015 when Department of Agriculture, MoAF with the assistance of the Food and Agriculture Organization (FAO) introduced two

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new varieties (*Amarila marangani* and *Amarila saccaca*) from Peru for ensuring household nutritional security, income and as a climate resilient crop against the rapidly changing climate.

In Bhutan, as quinoa could fit well with the existing maize and potato-based farming system, Agriculture Research and Development Center (ARDCs) carried out on- station and on-farm varietal evaluation trials of the introduced varieties to assess its adaptability and performance in varying agro-ecological zones since 2015.

Later in 2016, six additional new varieties were introduced from Peru followed by another one from India and another through informal sources were introduced and evaluated to provide varietal choice in future<sup>ii</sup>.

Considering the increasing importance given to this nutrient-dense cereal, quinoa intensification program in the east was streamlined into annual agriculture development plans through research outreach programs in potential sites, climate smart villages, youth farms and Land Use Certificate (LUCs) sites. Over the years, farmers were keen to take up

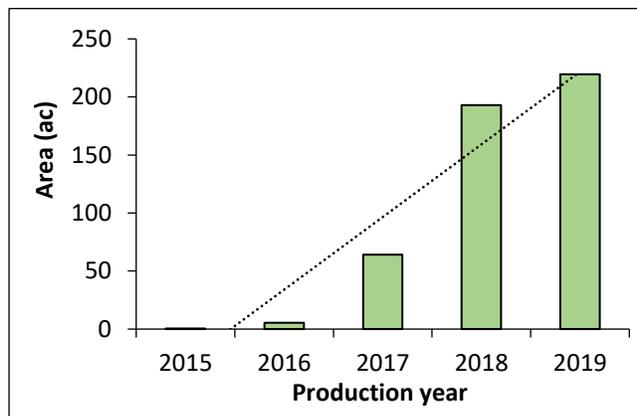


Figure 1 Trends in Production Area (Acres) 2015 to 2019

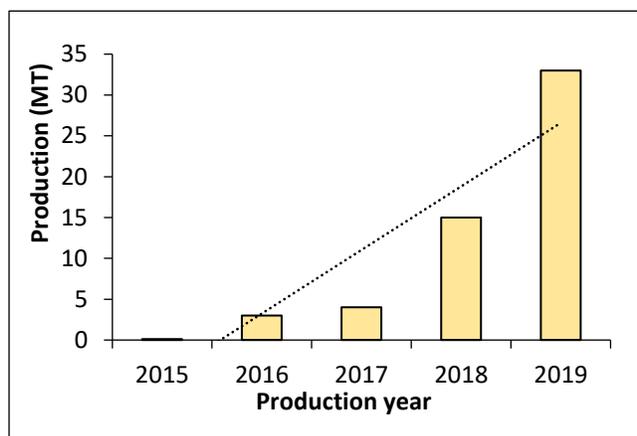


Figure 2 Trends in Production (MT) 2015 to 2019

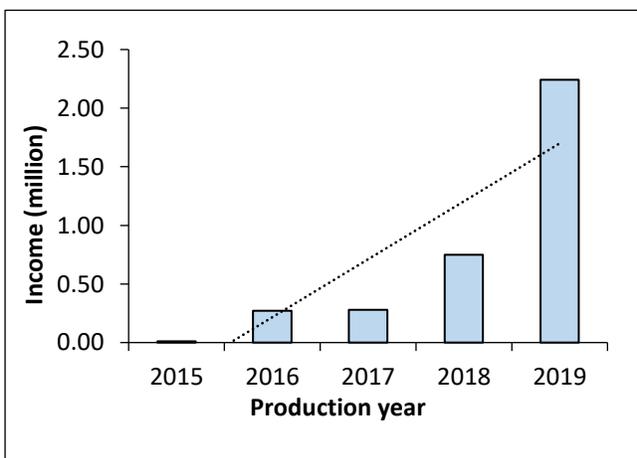


Figure 3. Trends in Income from sale of Quinoa 2015-2019

quinoa cultivation and thus the demand for quinoa seed has also increased which was met

through the center's basic seed production program and buy back from selected growers in the region.

In recent times, quinoa cultivation in eastern Dzongkhags modality has changed from individual promotional cultivation to community-based production at semi-commercial scale by small scale and medium scale farmers as a part of crop intensification for major cereal crop commodity development program in the 12<sup>th</sup> FYP.

Over the last five years (2015 to 2019), the promotion of quinoa in the six eastern Dzongkhags has experienced an increasing trend in the area, production and income as shown in Figure 1 to 3. Ever since the varietal evaluation in 2015 and 2016, the area expansion under quinoa cultivation has increased significantly from 64 acres in 2017 to 219 acres by 2019. However, the trends for households growing quinoa fluctuated over the years. By 2019, a total of 1,482 farmers have taken up cultivation. Despite variation in the number of households taking up quinoa production, the area for the crop followed a gradual increase annually as well.

During the initial years in 2015 and 2016, more than 90 % of the production was procured by research centers and Dzongkhags as a seed for crop intensification programs implemented from the Centre and the Dzongkhags. Currently, the Food Corporation of Bhutan Limited ( FCBL) is buying the major portion of the grains from the farmers through market facilitation by the Regional Agriculture Marketing and Cooperative office (RAMCO, Mongar) and the Geog Agriculture Extension Centre's in the region. During the last five years, income generated from quinoa has increased from Nu 0.010 Million in 2015 to Nu 2.240 million in 2019.

Multiple factors have led to increasing trends in the promotion of this new crop. The crop has received the highest level of advocacy followed by a consistent on-farm research evaluation, demonstrations and field days undertaken by the research centre and the geog extension centres in the region. The promotional price at Nu. 100 per Kg raw grain (unhusked) through the buyback mechanism instituted by MoAF mandated to FCBL and RAMCO, Mongar and linkages to shop outlets in Thimphu mainly the convenient stores and the One Geog One Product Shop Outlet (OGOP) have assured ready markets for the grains.

And most importantly, the promotion of the crop is followed up with the technical assistance and start-up seed supports from FAO through the DoA MoAF and ARDC Yusipang, the financial supports from the European Union Climate Change Adaptation Programs of MoAF.

In the eastern Dzongkhags, the introduction of the crops timed with the inception of the ongoing Commercial Agriculture Resilient Livelihoods Enhancement Program ( CARLEP-IFAD / MoAF) in the region which provided the required financial supports for seeds, small machines, conducting awareness and promotional programs through the Crop Intensification and diversification programs aimed to enhance resilience to climate change impacts through production enhancement and income generation.



Quinoa is gradually adjusting into the maize-based farming systems predominant in the six eastern Dzongkhags creating an opportunity for farmers in the region to bring nutritional improvement, livelihood enhancement and enhance climate resilience. However, in order to

achieve the maximum potential from growing this crop, observation shows that the promotion of this crop needs consistent monitoring and improve cultivation practices especially irrigation and soil fertility improvement with at least farmyard manure applications, mechanization and processing. Experimental yields of 0.750 t/acres to 1.1 t/acre and average farmers yield of 0.5 t/acre to 0.6 t/acre are reported<sup>iii</sup>.

Further production should focus on commercially acceptable varieties such as the Amarilla marangani (Ashi Heychum – AM), Amarilla Sacacca ( Ashi Heychum – AS) and DoA -1- 2015 (PMB) (Ashi Heychum TW). Research centers should fast track some additional promising varieties with higher market preference to enable diverse choices for growers and investors. Finally, a market based production planning and enterprise development through a value chain intervention targeting the creation of committed growers linked to processing, value addition and export enterprises will not only take the crop further into the region but will ensure a major livelihood source for small scale growers and enterprises.

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<sup>i</sup> Katwal TB and Bazile D (2020) First adaptation of quinoa in the Bhutanese mountain agriculture systems. PLoS ONE 15(1): e0219804. <https://doi.org/10.1371/journal.pone.0219804v>

<sup>ii</sup> Katwal, T.B., Wangdi, N., and Giri, P.L (2019) Adaptation of Quinoa in Bhutanese Cropping Systems. Bhutanese Journal of Agriculture 2(1) 71-80. Available at [www.bja.gov.bt/wp-content/uploads/2019/06/7-1.pdf](http://www.bja.gov.bt/wp-content/uploads/2019/06/7-1.pdf)

iii RDC Yusipang (2018) Quinoa General Information and Package of practices, Research and Development Centre Yusipang, DoA MoAF.