རྒྱལ་ཡོངས་རང་བཞིན་སོ་ནམ་ལྟེ་བ་ངོད་གསལ་སྤུངས།

National Centre for Organic Agriculture, Yusipang

Department of Agriculture

Ministry of Agriculture andForests, Thimphu, Bhutan

POTATO VARIETAL EVAUATIONTRIAL UNDER ORGANIC AND CONVENTIONAL MANAGEMENT

BACKGROUND

Potato (Solanum tuberosum L. 2n=4x=48)is the fourth most important non-grain crop in the world after wheat, maize and rice in terms of consumption (Campos & Oscar, 2020). The global cultivated area currently stands at 19 million hectares with total production about 378 million tons and consumed by more than billions of people worldwide(Devaux et al., 2020).New technological advancementhas enabled research and development of varietal technologiessuch as biofortified potato varieties and transformed many lives especially in the global south by addressing food and nutrition insecurity in recent years(Campos & Oscar, 2020). In Bhutan, potato crop has played a significant role in supporting the livelihood of farmers since its formal introduction in early 1970s (Rai et al., 2021; Roder, Nidup, Chettri, et al., 2008). Once commonly cultivated as a backyard crop is now one of the most widely cultivated, consumed and emerging market-orientedmajor crops in Bhutan(Bajgai et al., 2018; Rai et al., 2021; Roder, Nidup, & Chettri, 2008). Although, potatoes are grown in all parts of Bhutan, however, about 21000 households mostlyresiding in temperate agroecological zone between (mid to higher altitudes,1500 – 3000 metre above sea level (masl)) of Bumthang, Haa, Chukha, Monggar, Trashigang, Wangduephodrangetccultivate potatoes as a major food and cash crop for their livelihood in Bhutan(NSB, 2017; Roder, Nidup, & Chettri, 2008). The income farmers receive from the sale of potatoes directly help them purchase food essentialssuch as rice and other household necessities (Bajgai et al., 2018; Rai et al., 2021).In addition, a total of 30.08 metric tons of potatoes were exported earning over revenue of Nu. 709.81 million in 2019 higher than the revenue generated by horticultural crops combined(RSD, 2020). Thus, potato crop is not only a major livelihood support crop for the farmers but also an important national economic crop for Bhutan. Against this backdrop, given the national significance of this crop, National Potato Program (NPP) under National Centre for Organic Agriculture (NCOA) has been carrying out both research and development on-station and on-farmsconsistently. Unlike in the past, with recent mandate of NCOA to promote organic agriculture, NPP has undertaken on-station potato trials with an objective to a) compare the yield performance ofdifferent potato varieties under organic and conventional management b) select best varieties and propose for release as a new varietal technology for the farmers to achieve livelihood outcomes such food and nutrition security. We hypothesized that there will be yield difference of different varieties/clones under organic and conventional management.

MATERIAL AND METHOD

Between 2019-2021, advanced yield evaluation trials were conducted (mother trial) on-station (NCOA, Yusipang, altitude: 2600 masl). The experiments were set up in aRandomised Complete Block Design (RCBD) with three replicates each for both organic and conventional trials. The newly imported CIP potato clones from International Centre for Potato (CIP), Peru (389180.289, 398180.292, 398180.213, 398208.219 and local Desiree variety (as check) were used as the treatments.For both organic and conventional trials, identical plot size of 2.8 m2 (2 m x 1.4 m) was maintained for each treatment and twenty tubers were planted in two rows per treatment. Land was tilled with power-tillers and ridges were made manually. Potato tubers were planted manually with a distance of 20 cm between the plants and 70 cm between the rows. For conventional experiment, the crop was fertilized with the recommendedapplication dosage of 40:32:24 N:P: K kg/ac (NSSC, 2009)whilst 6 tons/acre of well decomposed farmyard manure was applied(DOA, 2019)for organic experiment.Yield data were first compiled, processed, cleaned and analysed using analysis of variance (ANOVA) in R statistical software. The crop was grown under rain-fed condition and no major plant protection measures were required.

RESULTS AND DISCUSSION

Overall, the results of the trials were statistically (P<.0.05) significant for both organic and conventional in terms of yield.Impressively, the yield performance of the potato clones for both conventional and organic trials ranged between 10 to 15 t/acrewhich are higher than the most of the released varieties except for the CIP398208.213 which exceeded beyond 15 t/acre under organic management.For conventional trial, on an average, CIP 398180.292 (15 t/acre) outyielded as compared to other clones. However, the yield difference with CIP398180.289 was as minimal as 0.6 t/acre and the lowest wasthe local Desiree (check variety) with an average of 7 t/acreonly. Rest two other clones were in between the highest and the lowestunder conventional management.While CIP398208.219 was the highest (17 t/acre) for the organic trial with as high as mean yield difference of 8.5 t/acrewhen compared to local Desiree (check variety).And similar to conventional trial, the rest of the three clones398180.289, 398180.292 and 398192.213 ranged above 10 t/acre but lower than 15 t/acre. Interestingly, we could increase potato productivity by 49% eachif we were to use CIP398208.219 and CIP 398180.292 for organic and conventional management respectively as compared to localDesiree variety.

CONCLUSION

Based on two years research, the results indicated that we have an ample and equal opportunity to augment production organically as depicted (Figure 1). In a nutshell, common to our heresy as “it is difficult to augmentcrop productivity organically”, the yield data explicated otherwise. Hence, there is a scope to explore further.

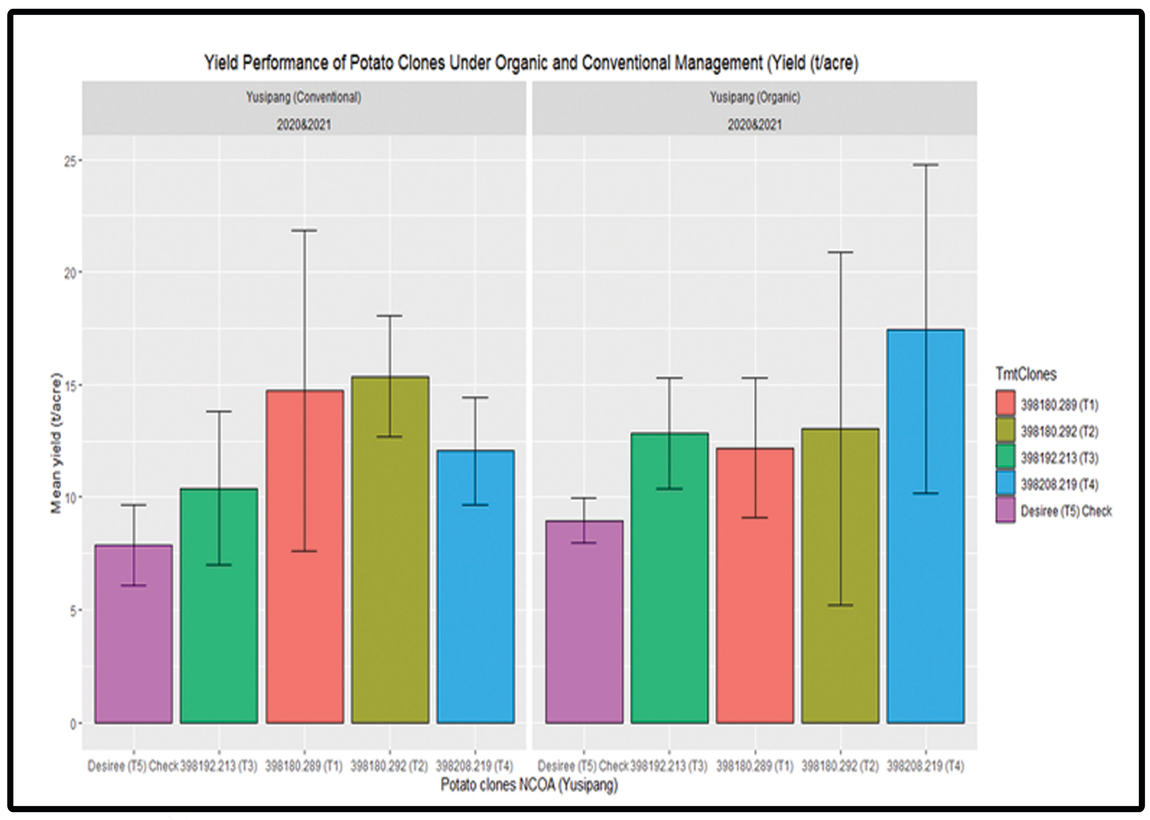

Figure 1: Overall comparative yield performance under organic and conventional management combined (2020&2021)

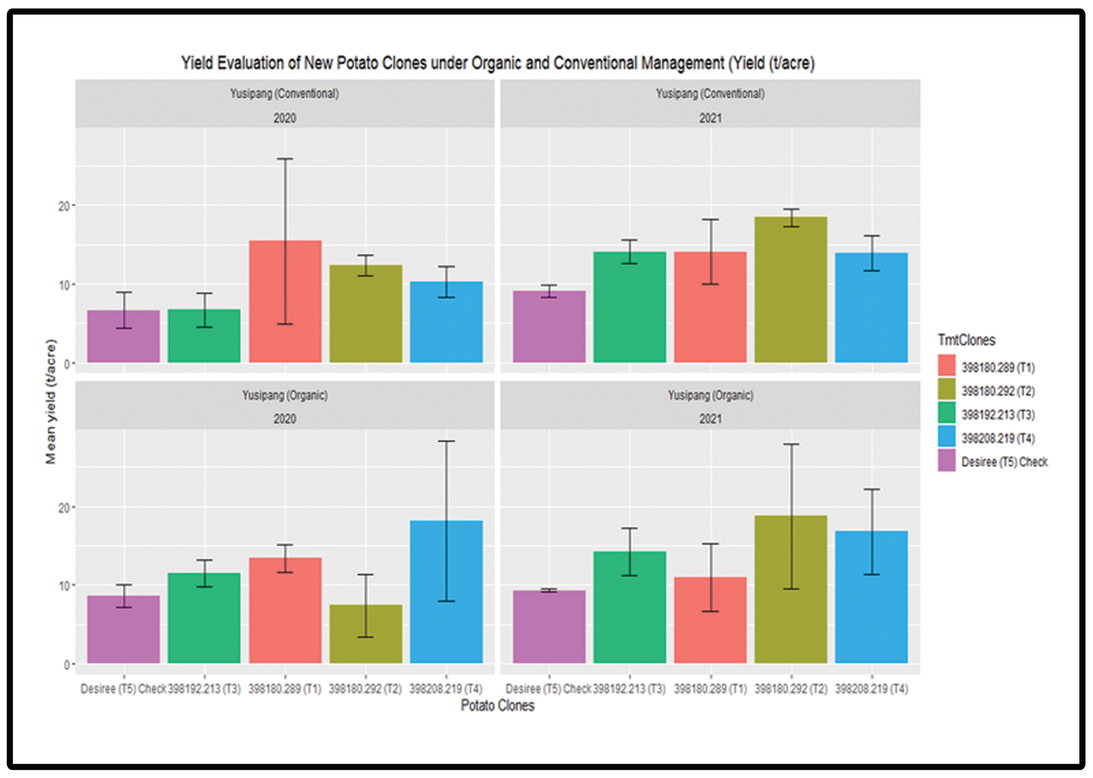

Figure 2: Yield performance under conventional and Organic management (2020&2021)

Authors: Pradeep Rai, YadunathBajgai (PhD)

Contact team: YadunathBajgai (PhD), Pradeep Rai, Lobzang, Sangay, Tshering Lhadon(NCOA) & Kuenzang (ARDSC-Khangma)

National Potato Program, National Centre for Organic Agriculture, Yusipang, Thimphu