

## Participatory Approaches for Enhancing Productivity and Profitability through Maize Based Cropping System in Manipur

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### Introduction

Maize is a multi-faceted crop used as food, feed and industrial purpose globally. Maize has a very prominent role to play in the Indian economy too. Currently this coarse grain is cultivated in about 10.2 Million hectare in India. The increasing interest of the consumers in nutritionally enriched products and rising demand for poultry feed which accounts 47% of total maize consumption are the driving forces behind increasing consumption of maize in the country. As per the demand estimates, the Indian maize production has to grow with CAGR of 15% in next 4-5 years. In the uplands of the Eastern Himalayan Region (EHR) of India, maize is the second most important crop and occupying considerable area. In the NEH Region, area under maize cultivation is ~0.23 million ha with production 0.37 million tonnes production with a very low productivity 1.47 t/ha as compared to average productivity of the country (NECS, 2015). The North Eastern Region of India having a wide number of germplasm is considered to be the Secondary origin of maize. Since, maize is an essential ingredient for feeds of animal, fish, poultry and cost of feed has soothe up very high, its importance is increasing day by day. Thus, maize is the most important emerging crop in the EHR. The average productivity of maize in Manipur is low with less than 1.5 t/ha as against national average of 2.60 t/ha. Thus, there is an urgent need to address the farmers' requirement for enhancement of their productivity.

The researcher recommendations are mostly target a particular cultivar or technology. If a technology works and is appropriate for one site or group of farmers, there is more justification for introducing it to areas and groups of farmers that fall within the same recommendation domain. Participatory approach plays a crucial role in validity of technology, accuracy and particularly the efficiency of the research process and its outputs.

In Manipur, maize production plays a significant role in ensuring food security and is used both for direct consumption and as well as for second cycle produce in piggery and poultry farming. Here, most of the area is comprises with terrace and sloping lands, where, land productivity and resource use efficiency (water and nutrient productivity; other resources and energy efficiency) is very less. However, successful maize production depends on the appropriate technology and accurate application of production inputs that will sustain the agricultural production. The success and level of profit from maize depend on the choice of technologies to be adopted. Spatial and temporal management practices are capable to produce 2 to 3 times more yields with better management practices over farmers practice.

### Status of maize production in Manipur

In Manipur, total maize area during 2017-18 was 26.93 thousand ha (74% kharif and 26% rabi) and production was 63.09 thousand metric tonnes (73% from kharif and 27% from rabi) with productivity of 2.34 t/ha (2.31 t/ha and 2.42 t/ha in kharif and rabi, respectively). The trend of maize cultivation area, production and productivity is increasing due to its significance and importance for food, feed and fodder (Figure 1 to 4).

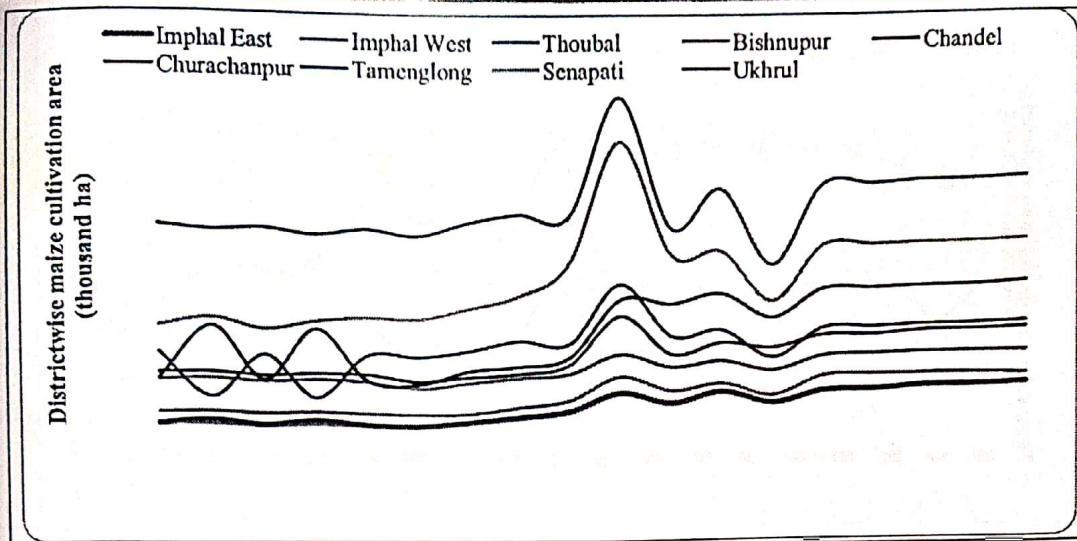


Fig 1. Districtwise maize cultivation area trends from 2000-01 to 2017-18

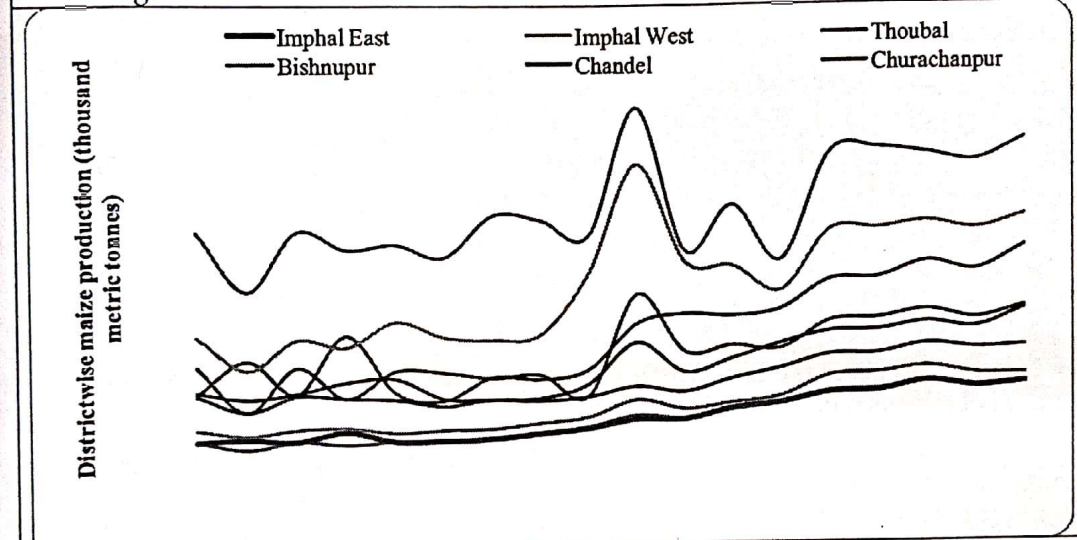


Fig 2. Districtwise maize production trends from 2000-01 to 2017-18

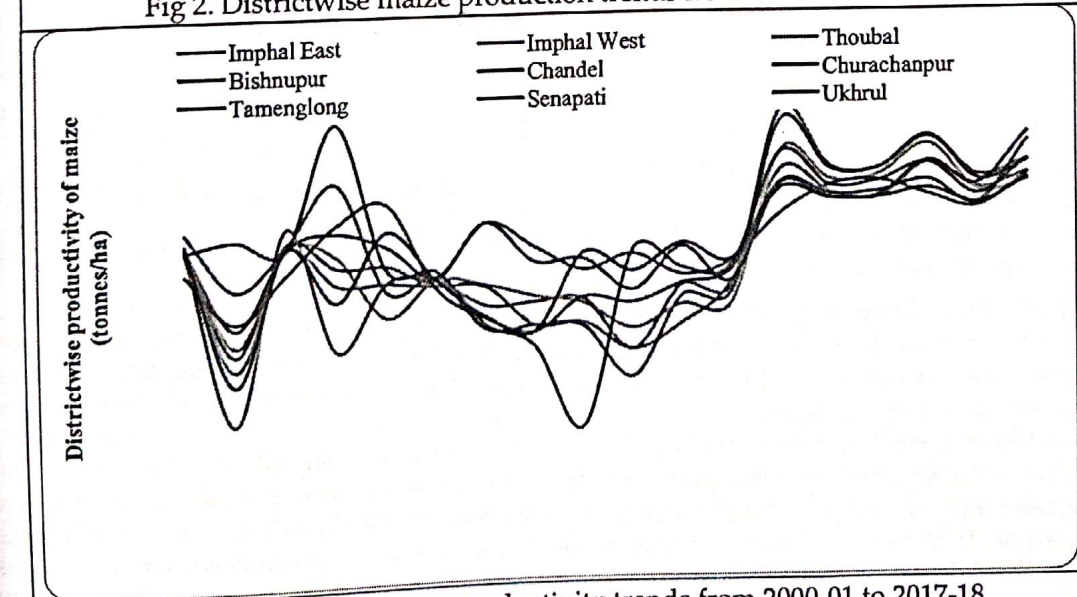


Fig 3. Districtwise maize productivity trends from 2000-01 to 2017-18

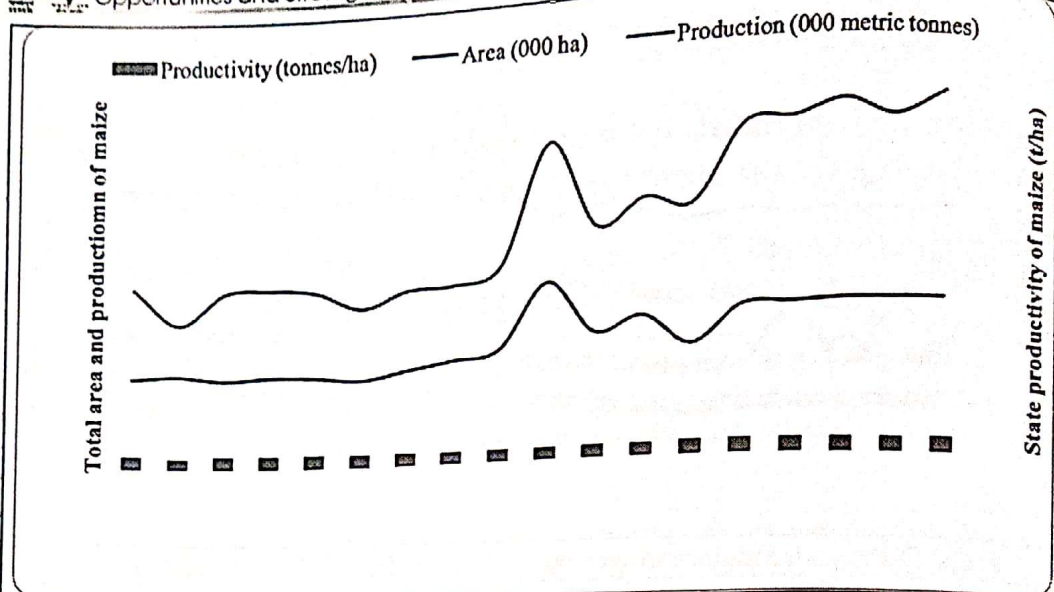


Fig 4. Total area, production and productivity of maize trends from 2000-01 to 2017-18 (Source: Department of Agriculture, Govt. of Manipur, <http://www.agrimanipur.gov.in/district-wise-area-production/>)

#### Technology Assessed and Disseminated through Participatory Approach

1. **Participatory dissemination of HYVs:** The high yielding varieties like quality protein maize (HQPM-1, HQPM-5), composite (Pusa composite and Vijay composite), etc. were demonstrated at farmers field by ICAR Manipur Centre in collaboration with ICAR-Indian Institute of Maize Research, Ludhiana. The technologies were disseminated across the Manipur (Valley, foot hills and hill districts). The farmers produced more than 4.2 t/ha maize grain and earned average net returns more than Rs 45000/ha.
2. **Participatory dissemination of Maize- vegetable pea cropping system:** ICAR Research complex for NEH Region, Manipur Centre demonstrated the maize- vegetable pea cropping system in collaboration with ICAR-IIMR, PAU Punjab, at farmers field and farmers yield varied from 8 to 11 t/ha Maize equivalent yield.
3. **Participatory dissemination of maize- rapeseed and mustard cropping system:** ICAR Research complex for NEH Region, Manipur Centre demonstrated the maize- vegetable pea cropping system in collaboration with ICAR-IIMR, PAU Punjab, at farmers field and farmers yield varied from 7 to 10 t/ha maize equivalent yield.
4. **Participatory dissemination of Maize- vegetable cropping system:** ICAR Research complex for NEH Region, Manipur Centre demonstrated the maize- vegetable pea cropping system in collaboration with ICAR-IIMR, PAU Punjab, at farmers field and farmers produced more than 14 t/ha Maize equivalent yield.
5. **Participatory dissemination of maize based intercropping system :** ICAR Research complex for NEH Region, Manipur Centre demonstrated the maize based intercropping system on farmer's field in various districts of Manipur. Among the various maize based cropping system, on an average maximum maize equivalent yield was found in maize + groundnut (R) (6.33 t/ha) followed by maize + soybean (A) than maize sole cropping (3.4 t/ha) (Figure). Maize + Groundnut (A), maize + greengram (A), maize + urdbean (A), maize + rajma (R), and maize + ricebean (R) were fetched higher economic returns as compared to sole cropping of maize. Based on MSP fixed by Govt. of India, across the targeted area farmers earned net returns from Rs 25410 to 60555/ha from HYVs (After deducting the cost of cultivation) as compared to farmers grown local genotype Chaochujak (1.9 t/ha).

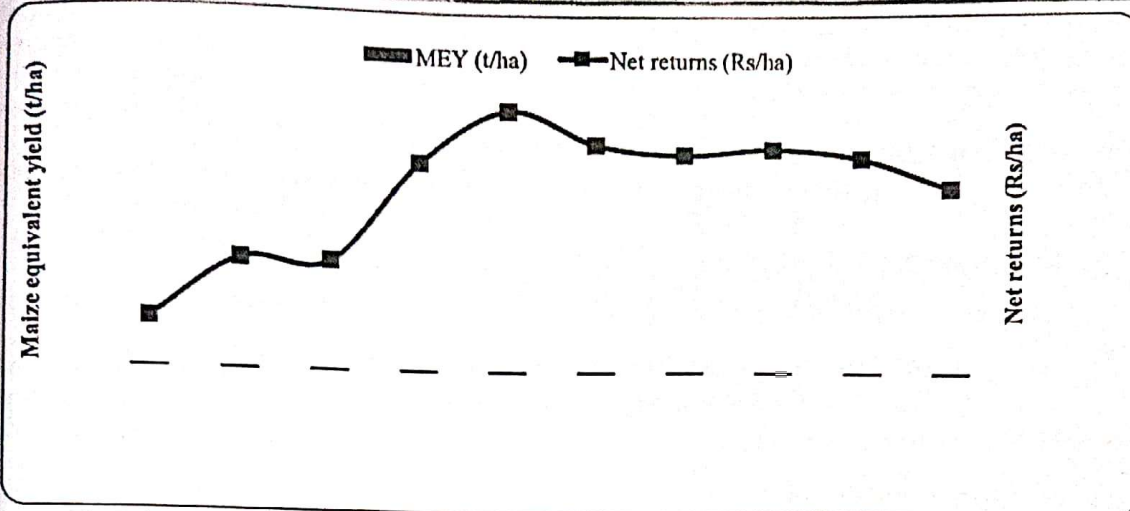


Fig 5. Maize equivalent yield and net returns as influenced by intercropping in maize

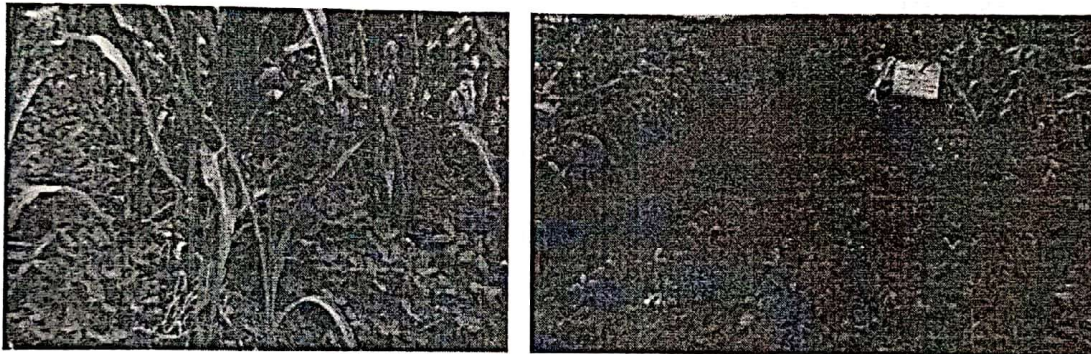


Fig 6. Groundnut grown under additive and replacement series with maize in Churachandpur

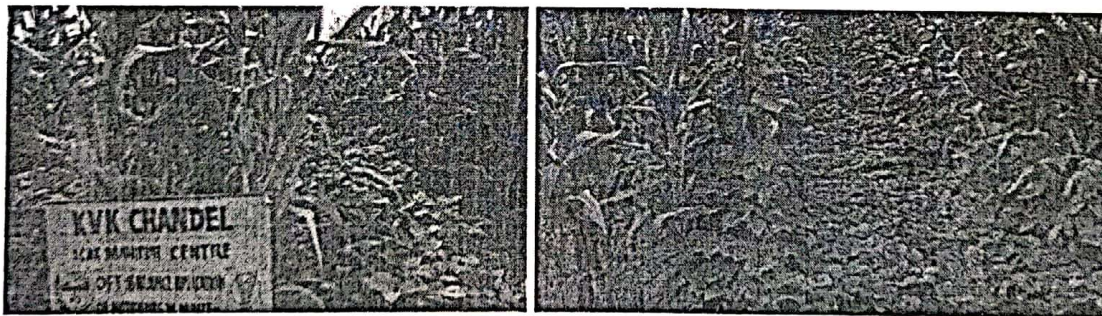


Fig 7. Soybean and ricebean grown under replacement series with maize in Chandel and Churachandpur

### Conclusions

It is in response to such increasing demand, NEHR needs to plan production by productivity increase and also reorient value chain if it is to serve the basic goal of remunerative prices for farmers. This time the driver of change is surge in demand for maize from maize based businesses, be it poultry, feed, starch or processed food. High yielding varieties of maize widely adopted in other parts of country, but in the NEHR, most of the farmers are growing low yielding local genotypes. It is anticipated that HYVs of maize with better management practices have immense potential to increase the existing production level by 2-3 times in the hilly ecosystem of NEHR. To achieve sustainable double maize yield and enhance the farmer's income five pillars move together Linkage and aggregation with all stakeholders, enabling infrastructure at grassroots level, forging PPP, Policy framework and technological intervention.