

## Correlating Growth, Yield and Adoption of Urdbean Technologies

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### ABSTRACT

Front Line Demonstrations (FLD) on urdbean were undertaken by the Krishi Vigyan Kendra, East Sikkim, ICAR Sikkim Centre, Ranipool in the district for 4 consecutive years starting from 2005 to 2008 during the kharif season in 20 villages spreading over 14 blocks to disseminate the improved agro-technology of urdbean for boosting productivity and to assess the economic viability and technological feasibility of the latest urdbean production technologies over the existing one. The highest seed yield ( $1340 \text{ kg ha}^{-1}$ ) was recorded under FLD in the year 2006 as against  $890 \text{ kg ha}^{-1}$  under farmers' practices. Fifty four percent increase in the yield was obtained under FLD over farmers' practice during the year 2007. The lowest yield of  $812 \text{ kg ha}^{-1}$  was registered under FLD vis-à-vis  $530 \text{ kg ha}^{-1}$  in farmers' practices during 2008. The result revealed that even in case of lowest yield under FLD, the increase was recorded to be 43 per cent over the farmers' practice in the year 2005. The economic viability and profitability showed that the benefit cost ratio (B: C) was higher in the case of improved agro-technologies (FLD) with 2.60 as against 1.94 in farmers' practice (FP). The net return from improved agro-technologies (FLD) was Rs. 20,005  $\text{ha}^{-1}$  as against Rs. 1, 2205  $\text{ha}^{-1}$  from farmers' practices. The variation in agro-climatic parameters as well as locations of FLD programme was effective in changing the attitude, skill and knowledge of the farmers for adoption of improved technology/HYV of urdbean and further wide scale diffusion to the other farmers. It also improved the relationship between the farmers and scientist and built confidence between them.

**Key words:** Urdbean; FLD programme; Farmers' practice (FP); Economic viability; Benefit cost ratio (B:C);

Agriculture is the main stay of life in East district of Sikkim with a gross cropped area of 42,176 ha. The district contributes to 34% of the total food grain production in the State. The district has three subdivisions, four major towns, 120 revenue blocks, 14 forest blocks, 273 Panchayat wards and 50 Panchayat units. The district has a subtropical and temperate climate with high rainfall and humidity. Average temperature of the district varies from 17-30°C in summer and 5-20°C in winter. The annual rainfall of the district is about 3500 mm. Maximum rainfall is received during the month of May to September. Most of the cultivated land is terraced. Urdbean (*Vigna mungo* L. Hepper) is one of the important pulse crop grown in Sikkim. It is grown as sole crop, mixed crop, catch crop in the hill terrains of Sikkim during Kharif season. Urdbean is locally known as *Kalodal*; contains 24% protein, 60% carbohydrates, 1.3 % fat and very rich in phosphoric

acid. It can be grown successfully from sea level up to an elevation of 1800 meters. Being a leguminous crop, urdbean has the capacity to fix biological nitrogen and thus helps in restoring the soil fertility for sustainable agriculture. It also acts as cover crop and its deep root system protects the soil from erosion. East district of Sikkim covers 390 ha of land under urdbean cultivation with a total production of 280 tons and average productivity of  $718 \text{ kg ha}^{-1}$  (Table 3). The reasons for low productivity may be traditional methods of cultivation practiced by the farmers. With the development of high yielding varieties and better management practices, there is a much scope for further increase in yield.

The recommended production technologies which are proved to be superior over the existing ones need to be demonstrated at farmers' field under the prevalent farming situation with the close supervision of KVK scientists to exploit their maximum potential and to get

the feed back for wide scale diffusion are called Front Line Demonstration (FLD). The primary objective of this FLD is to spread the newly released high yielding variety of urdbean with improved production technologies at the farmers' field by exploiting their available resources and acquaint them with front line varietal as well as management technologies leading to wide scale adoption and diffusion of technology at farmers' level. Keeping eye upon this, the study was undertaken with the following objectives:

- i. To disseminate the improved agro-technology of urdbean for boosting productivity
- ii. To assess the economic viability of the latest urdbean production technologies over the existing one.
- iii. To assess the extent of adoption of improved agro-technology of urdbean and
- iv. To find out the relationship between the seed yield with crop parameters and adoption of improved agro-technology of urdbean

## METHODOLOGY

Front Line Demonstration on HYV and improved agro-technology of urdbean was conducted by KVK, ICAR Sikkim Centre, Ranipool, Sikkim for four consecutive year viz., 2005, 2006, 2007 and 2008 in 20 villages of 14 blocks viz. Ranka, Assam Lingzey, Sama, Simik, Nandok, Rawate Rumtek, Rey, Sajong, Samdur, Samlikmarchak, Aho, Dikling, Namcheypong, Yangtham. The totals of 94 numbers of farmers were associated under this programme. The improved agro-technology of urdbean was demonstrated in an area of 0.10 to 0.20 ha of each farmer. In total of 13 ha of area were covered during 4 years of demonstration of recommended improved agro-technologies of urdbean. In each demonstration, one control plot was also kept where farmers' practices were carried out. The results in both the cases were recorded and a comparison was made with respect to some related parameters.

The data for the study during 2005-2008 was obtained from the 94 farmers in East district of Sikkim spreading over 20 villages in 14 blocks, where the FLD programme was implemented by the KVK. The technologies demonstrated and farmers' practices are shown in Table 1. The qualitative data were

converted into quantitative form and expressed as percent increase in yield and was calculated by using following formula-

$$\% \text{ increased in yield} = \frac{\text{Demo.yield} - \text{Farmers' yield}}{\text{Farmers' yield}} \times 100$$

The data on extent of adoption were collected using pre-tested structured schedule by personal interview method from 94 farmers under FLD. The extent of adoption of 9 important cultivation practices i.e. variety, seed rate, seed treatment, sowing method, sowing time, spacing, organic manures, Liming/dolomite application and plant protection measures were considered for the study. The relationship between seed yield and crop parameters for adoption of improved agro-technology were also studied with the simple correlation analysis.

**Table 1. Details of demonstration packages and farmers' practice under FLD on Urdbean**

| Particulars       | Demonstration packages   | Farmers practices (Local check)             |
|-------------------|--|---|
| Variety           | Pant U 19 and T 9  | Local <i>Kalodal</i>                        |
| Seed rate         | 20 kg ha <sup>-1</sup>   | 30 kg ha <sup>-1</sup>                      |
| Seed treatment    | <i>Rhizobium</i> & <i>PSB</i>                                      | Nil   |
| Sowing method     | Line sowing (30x10cm)  | Broadcasting                                |
| Sowing time       | Mid June to Mid July   | 1st week of June                            |
| Farming situation | Upland rainfed terraced  | Upland rainfed terraced                     |
| Manures           | FYM @ 2 t ha <sup>-1</sup> + Vermicompost @ 500kg ha <sup>-1</sup> | Nil   |
| Liming/Dolomite   | 500kg ha <sup>-1</sup> in furrows                                  | Nil   |
| Plant protection  | Need based bio-insecticides & bio-fungicides spray                 | No application of insecticides & fungicides |

## RESULTS AND DISCUSSION

*Adoption of improved agro-technology* : The results obtained during four years of demonstrations are presented in Table 2. The result revealed that the highest seed yield in the FLD plot and farmers plot were 1340 kg ha<sup>-1</sup> and 890 kg ha<sup>-1</sup>, respectively during 2006 and lowest yields were in the year of 2008. The results clearly indicates that due to knowledge and adoption of

appropriate agro-technology, the yield of urdbean could be increased by 43,51, 54 and 53 percent over the yield obtained under farmers practice of urdbean cultivation in 2005, 2006, 2007 and 2008, respectively (Table 2). The above findings are similar with the findings of Singh (2002) and Kirar et al., (2006).

**Table 2. Impact of FLD on productivity of urdbean**

| Year       | No. of demo. | Area (ha.) | Average yield (kg ha <sup>-1</sup> ) |     | % increase in yield over farmers' practice |
|------------|--------------|------------|--------------------------------------|-----|--|
|            |              |            | FLD                                  | FP  |  |
| 2005       | 26           | 3          | 1190                                 | 830 | 43   |
| 2006       | 26           | 3          | 1340                                 | 890 | 51   |
| 2007       | 35           | 5          | 1090                                 | 710 | 54   |
| 2008       | 7            | 2          | 812                                  | 530 | 53   |
| Total/Avg. | 13           | 1          | 108                                  | 740 | 50   |

**Table 3. District wise area and productivity of urdbean in Sikkim (2006-07)**

| District     | Area (ha) | Productivity (kg ha <sup>-1</sup> ) |
|--------------|-----------|-------------------------------------|
| East         | 390       | 718                                 |
| North        | 20        | 200                                 |
| South        | 1340      | 784                                 |
| West         | 1800      | 784                                 |
| Sikkim State | 3550      | 783                                 |

\* Source : Sikkim-A Statistical Profile - 2006-07, Department of Economics, Statistics, Monitoring and Evaluation, Government of Sikkim

**Table 4. Impact of FLD urdbean on economic viability**

| Parameters | Gross return (Rs ha <sup>-1</sup> ) | Cost of cultivation (Rs ha <sup>-1</sup> ) | Net return (Rs ha <sup>-1</sup> ) | B:C  |
|------------|-------------------------------------|--|-----------------------------------|------|
| FLD        | 27,700                              | 7,695                                      | 20,005                            | 2.60 |
| FP         | 18,500                              | 6,295                                      | 12,205                            | 1.94 |

**Economic viability of agro-technology:** As indicated in Table 2, the average productivity of urdbean under demonstration (FLD) was 1108 kg ha<sup>-1</sup> against 740 kg ha<sup>-1</sup> in farmers' practice (FP). The increase in productivity was mainly due to varied agro-climatic parameters and locations of the FLD under rainfed terraced situation in the East district of Sikkim. To estimate the monetary benefit, cost benefit analysis was worked out and the results are presented in Table 4. Data revealed that benefit cost ratio (B:C) was higher in case of improved agro-technologies (FLD) with 2.60 as against 1.94 in case of farmers' practice (FP). The net return from improved agro-technologies (FLD) was

Rs. 20,005 ha<sup>-1</sup> as against Rs. 12,205 ha<sup>-1</sup> from farmers' practices. This finding is in corroboration with the findings of Tripathi et al., (2003).

**Practice wise extent of adoption of urdbean Agro-technology :** The respondents were categorized as low (up to 33.33 %), medium (33.34 to 66.66 %) and high adoption (above 66.66 %) categories depending upon their responses on adoption of urdbean agro-technology. Practice wise extent of adoption of urdbean agro-technology is described below.

**Varieties:** The data presented in Table 5 revealed that majority of the FLD farmers (51.06%) fall in low adoption category followed by medium (36.17%) and high adoption category (12.77 %). Low adoption might be due to the non availability of seed of high yielding varieties, lack of knowledge, lack of technical guidance and high cost of seed.

**Seed rate:** It was found that 62.77 per cent belonged to high adoption category and 37.23 % belong to medium adoption category of FLD farmers of urdbean.

**Seed treatment:** Majority of the FLD on urdbean farmers (83 %) belonged to low adoption category. Possible reason for low adoption may be lack of knowledge, technical guidance and high cost of fungicides.

**Sowing method:** It is evident that 20.21,29.79 and 50.0 per cent FLD farmers on urdbean belonged to low, medium and high adoption category, respectively

**Sowing time:** Table 5 shows that 79.79 per cent farmers under FLD on urdbean were in medium adoption category followed by low (11.70 %) and high adoption category (8.51 %) The reason might be lack of moisture in the field, lack of sowing implements and non-availability of seed in time.

**Spacing:** Majority of FLD on urdbean farmers (75.53 %) belonged to high adoption category. Only 3.19 and 21.28 per cent farmers belonged to low and medium adoption category.

**organic manures:** A perusal of Table 5 reveals that 81.91 per cent of FLD farmers were in high adoption category followed by medium (10.64 %) and low adoption category (7.45 %). High adoption might be due to organic state and banned on application of chemical fertiliser in Sikkim.

**Liming/dolomite:** It is evident that about 62.77 per cent of FLD farmers were in high adoption category

followed by medium (23.40 %) and low adoption category (13.83 %). High adoption might be due to organic state and acidic nature of soils in Sikkim.

*Plant protection measures:* 96.81 per cent farmers were in low adoption category and rest 1.06 per cent were in high adoption category. The reason may be due to lack of knowledge, lack of technical guidance, high cost and banned of plant protection chemicals, non-availability of organic plant protection chemicals and lack of finance.

**Table 5. Extent of adoption of urdbean production technology in East Sikkim**

| Agro-technology    | Extent of adoption |               |               |
|--------------------|--------------------|---------------|---------------|
|                    | Low                | Medium        | High          |
| 1.Variety          | 48<br>(51.06)      | 34<br>(36.17) | 12<br>(12.77) |
| 2.Seed rate        | -                  | 35<br>(37.23) | 59<br>(62.77) |
| 3.Seed treatment   | 83<br>(88.30)      | 8<br>(8.51)   | 3<br>(3.19)   |
| 4.Sowing method    | 19<br>(20.21)      | 28<br>(29.79) | 47<br>(50.0)  |
| 5.Sowing time      | 11<br>(11.70)      | 75<br>(79.79) | 8<br>(8.51)   |
| 6.Spacing          | 3<br>(3.19)        | 20<br>(21.28) | 71<br>(75.53) |
| 7.Organic Manures  | 7<br>(7.45)        | 10<br>(10.64) | 77<br>(81.91) |
| 8.Liming/Dolomite  | 13<br>(13.83)      | 22<br>(23.40) | 59<br>(62.77) |
| 9.Plant protection | 91<br>(96.81)      | 2<br>(2.13)   | 1<br>(1.06)   |

(Figures in parenthesis indicates the percentage of the respondents)

*Overall adoption of urdbean agro- technology :* The data presented in Table 6 indicated that overall majority of the farmers (69.10 %) had medium adoption followed by low (18.10 %) and high adoption (12.80 %). These findings are in conformity with the findings of *Methi and Hachinal (1994) and Manhas et al. (2003)*.

It is evident from Table 7, that the seed yield of urdbean was positively and significantly correlated with growth and yield parameters of urdbean viz., Plant height(cm), Branches/plant, Cluster/plant, Pods/plant, Pod length(cm), Seeds/pod and 100 -seed weight(g) both under demonstrated and farmers practices. The positive relationship between the seed

yield and crop parameters influenced the increasing pattern of seed yield which leads to higher in adoption of improved agro-technology of urdbean. Positive correlation between grain yield and yield attributes were also noted by *Kohle et al.(1987), Phogat and Pandey (1998) and Saha et al.(2003)*.

**Table 6. Distribution of respondents according to their overall adoption of urdbean agro-technology**

| Adoption                          | Total FLD respondent |       |
|-----------------------------------|----------------------|-------|
|                                   | No.                  | %     |
| Low adoption ( up to 33.33%)      | 17                   | 18.1  |
| Medium adoption (33.34 to 66.66%) | 65                   | 69.1  |
| High adoption (above 66.66%)      | 12                   | 12.8  |
| Total                             | 94                   | 100.0 |

**Table 7. Relationship between seed yield with crop parameters for adoption of improved agro-technology of urdbean**

| S. No. | Growth and yield parameters | Mean data |     | Correlation co-efficient (r*) |        |
|--------|-----------------------------|-----------|-----|-------------------------------|--------|
|        |                             | FLD       | FP  | FLD                           | FP     |
| 1.     | Plant height (cm)           | 116       | 91  | 0.8683                        | 0.8683 |
| 2.     | Branches/plant              | 3.2       | 2.3 | 0.7509                        | 0.7509 |
| 3      | Cluster/plant               | 10        | 6.5 | 0.6979                        | 0.6979 |
| 4.     | Pods/plant                  | 32        | 22  | 0.7710                        | 0.7710 |
| 5.     | Pod length (cm)             | 3.3       | 2.0 | 0.3409                        | 0.3409 |
| 6.     | Seeds/pod                   | 3.1       | 2.0 | 0.5377                        | 0.5377 |
| 7.     | 100 -seed weight (g)        | 3.0       | 2.2 | 0.3128                        | 0.3128 |
| 8.     | Seed yield (kg/ha)          | 1108      | 740 | -                             | -      |

\*Significant at P=0.05 level

## CONCLUSION

Front Line Demonstration programme was effective in changing attitude, skill and knowledge of the farmers about improved practices of HYV of urdbean including adoption of improved agro-technology. This developed the confidence and reliability of the farmers on the improved technology of urdbean. The demonstration farmers acted also as source of information and pure seeds producer for wider dissemination and adoption of HYV of urdbean by other farmers.

The productivity gain under FLD over traditional practices of urdbean cultivation created greater awareness and motivated the other farmers to adopt appropriate production technology of urdbean in the

district. The selection of critical input and participatory approach in planning and conducting the demonstration definitely helped in the speedy and wider dissemination of technology to other members of the farming community in East Sikkim district in particular and in Sikkim as a whole. From the findings, it is seen that majority of the farmers (69.10 %) had medium adoption followed by low (18.10 %) and high adoption (12.80 %) categories. The low adoption practices such as 'variety', 'seed treatment' and 'plant protection measures', medium adoption for the practices such as 'variety', seed rate and sowing time and high adoption for the practices such as 'seed rate', 'sowing method' 'spacing' organic manures and liming/dolomite application of

urdbean improved agro-technology. However, the seed yield of urdbean was positively and significantly correlated with growth and yield parameters of urdbean viz., Plant height (cm), Branches/plant, Cluster/plant, Pods/plant, Pod length (cm), Seeds/pod and 100 -seed weight (g) both under demonstrated and farmers practices. It may be concluded that the agro-technology demonstrated on urdbean under front line demonstrations has been exploited for obtaining maximum productivity potential, good profit leading to economically viable farming in the district. Thus ameliorating the socio-economic standard of farming community of the region.

*Paper received on* : February 12, 2010

*Accepted on* : April 11, 2010

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