

## **Maize seed production communities in hills towards a new path of contract seed production in Nepal**

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HMRP/CIMMYT Int.

### **Abstract**

Seed production of farmers preferred improved maize varieties under community based seed production (CBSP) group initiated in the hills of Nepal under Hill Maize Research Project in 2000. Trained members of the community group produce improved seeds identified through participatory varietal selection procedures. Despite quantum jump in maize seed production, 14 tons by 7 CBSP groups in 2000 to 1,036 tons by 207 groups in 2012, seed marketing remained one of the challenges in HMRP districts. Main objective of this study was to analyze maize seed production trend and pre-sowing seed contracts in hill districts under HMRP. Linear regression model showed seed production trend over the period 2000 to 2012 highly significant. Annual compounded growth rate of seed during the same period was estimated to be 34.36%. Pre-sowing seed contract in cereal crops in the hills of Nepal is a new initiative of HMRP IV. Analysis showed 63 formal contracts were signed for 170.45 tons of improved maize seed between 50 CBSP groups and 24 private seed buyers/traders.

**Key words :** community based seed production, pre-sowing seed contract, participatory variety selection, marketable surplus

### **Introduction**

Maize is a second important cereal crops in Nepal in terms of area and production. It is grown in 871,387 ha which is about 28% of total cultivated area of 3.09 million ha (MoAD -2012). Of the total maize area about 78% falls in the hills area (mid hills 70%, and high hills 8%). Total production of maize in 2012 was 2.18 million tons (MoAD, 2012). National average yield of maize is 2.5 t/ha. Seed replacement rate in maize is about 11.3% (S. Pokharel, 2013). More than 88% farmers used farm saved seeds (Gurung, 2011).

Community Based Seed Production (CBSP) Group follows the approach of forming a community based farmer group comprising 10 - 25 members and registered in District Agriculture Development Office. Trained members of the CBSP group (women and disadvantaged groups) produce improved/foundation maize seed of most preferred variety identified through participatory varietal selection procedures.

Seed multiplication of improved maize varieties through CBSP groups was initiated in Hill Maize Research Project in 2000. Seed production through CBSP groups in HMRP has been a very successful model in Nepal, and has significantly contributed to increase the seed replacement rate (SRR). This approach has also helped increase the adoption of improved maize varieties and technologies and thereby improving food security and livelihoods of the hill people.

Despite several efforts, maize seed marketing is one of the challenges faced by several public and private and sector institutions in Nepal. Limited involvement of private sector in this business is

mainly due to less incentive whereas limited organizations and infrastructures hold true for public sector. Involving in seed production without considering the demand and supply market cannot be viable in long run.

Pre-sowing seed contract (PSSC) under the HMRP-IV is said to be first initiative in cereals seed system in the hills of Nepal (KC, 2012). This approach fully ensures demand and supply of seed particularly quantity, seed standard and variety. Under this arrangement, the seed producer/seller (CBSP groups) and seed trader/buyer (agrovet/seed companies) sign a formal contract specifying the conditions of mutual benefits. Moreover, pre-sowing seed contract approach ensures a win-win situation for both the CBSP groups and seed traders particularly those who are located in the remote parts of the country. More specifically, this approach creates a favorable environment for private sectors in seed business. PSSC also help improve the current situation of seed surplus in some areas and the deficit in other.

## **Objective**

Main objective of this study was to analyze maize seed production trend over the period 2000 to 2012 and pre-sowing seed contracts in hill districts under HMRP.

## **Methodology**

This study primarily used the secondary information obtained from the reports and proceeding mainly of HMRP and related organizations. However, primary data also gathered through various rounds of focus group discussion in the CBSP groups and key informant survey in the related organizations.

This study covered analyses on (i) maize seed production trend of HMRP supported CBSP groups during 2000-2012. Linear regression model was used to estimate and forecast seed production trend. Goodness-of-fit was estimated through ordinary least square (OLS) method. (ii) Annual growth rate of seed produced by those CBSP group was also calculated. (iii) Analysis of pre-sowing seed contract (PSSC) was done, by contracted volume, variety, district, type of seed sellers and buyers.

## **Theoretical framework**

When a time series shows an upward and downward long term linear trend, then regression analysis can be used to estimate this trend and project the trends into forecasting the future values of the variables involved (Chandan, 1998). OLS could be used to find "line of the best fit" or "Goodness of fit" between two variables. Coefficient of determination ( $R^2$ ) is used to estimate the proportion of the total variation in Y "explained" by the regression of Y on X.

## **Empirical model**

### **(i) Trend analysis. linear regression model**

Straight line equation was used to describe linear relationship between independent variable (time,t) and dependent variable, maize seed production (Y, ton) which was captured by the following equation.

$$Y_t = b_0 + b_1t$$

Where.

$Y_t$ = forecast value of time series in period t

$b_0$ = intercept of the trend line

$b_1$ = slope of trend line

t= time period

$$b_1 = \frac{n \sum (ty) - (\sum t)(\sum y)}{n(\sum t^2) - (\sum t)^2}$$

$$b_0 = \bar{y} - b_1 \bar{t}$$

Where.

y= actual value of time series in period t

n= number of periods

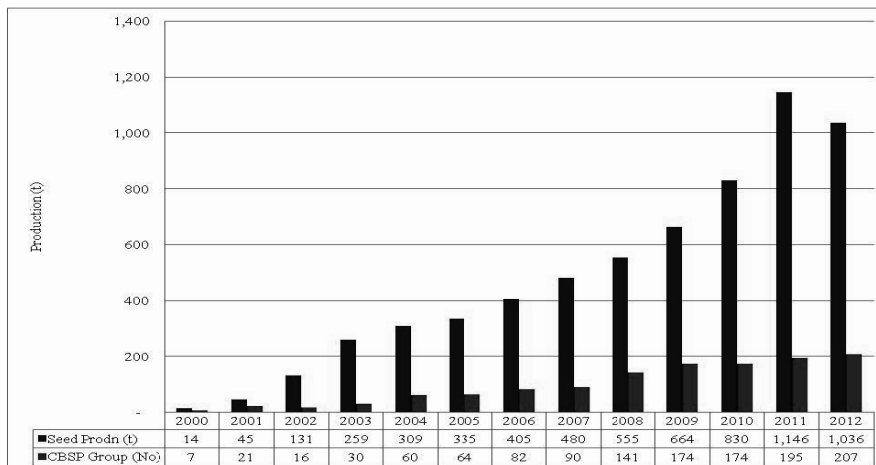
$$\bar{y} = \text{average of the time series} = \sum Y / n$$

$$\bar{t} = \text{average value of t} = \sum t / n$$

(ii) Growth rate

Annual compounded growth rate (ACGR) of seed production was estimated by taking antilog of time coefficient (t) through the equation, ACGR (%)= (Exp(1))<sup>(b1)</sup>-1)\*100

Hypothesis.  $H_0: b_1=0$ ; and  $R^2=0$ ;  $t_{[\alpha=0.05, df(n-k)]}$ . Decision- if probability of the parameter concerned  $< \alpha$  the parameter is significant and reject  $H_0$ . Conclusion- The increment of seed production over the period is significant.



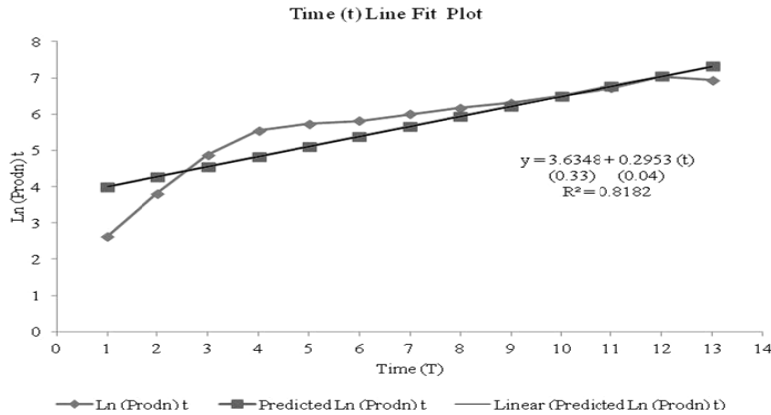
**Figure 1. Seed production (t), by CBSP group and year**

## Result and conclusion

### Seed production trend

Seed production under CBSP approach in HMRP districts was started in 2000 (HMRP, 2012). Analysis showed that in 2002, about 14 tons of improved maize seed was produced by 7 CBSP groups, and 13 years later (2012), about 1,036 ton seed was produced by 207 CBSP groups. Of the total surplus seed of 2012, about 862 tons seed was marketed/ distributed mainly across the 20 hill districts (HMRP, 2012). Seed production (t), by CBSP groups (no.) and year is presented in **Figure 1**.

Regression analysis showed that the time coefficient was highly significant ( $p < 0.01$ ). Similarly, the ANOVA result showed that the regression model was also highly significant ( $p < 0.01$ ) with  $R^2 = 0.81$  (**Figure 2**). Since, the probability of the time coefficient appeared to be much lower than set significance level (0.05) null hypothesis is rejected meaning  $b_1$  and  $R^2$  are not zero, significantly different from zero.



**Figure 2. Seed production trend in HMRP (2000- 2012)**

Regression Statistics	
Multiple R	0.9046
R Square	0.8182
Adjusted R Square	0.8017
Standard Error	0.5662
Observations	13

ANOVA					
	df	SS	MS	F***	Significance F
Regression	1	15.8748	15.8748	49.52	2.2E-05
Residual	11	3.5264	0.3206		
Total	12	19.4013			

	Coefficients	Standard Error	t Stat	P-value
Intercept	3.6348	0.3331	10.91	3.1E-07
Time (t)***	0.2953	0.0420	7.04	2.2E-05

### **Seed production growth rate**

Analysis showed that annual compounded growth rate of improved maize seed production over 13 years period (2000 to 2012) is estimated to be 34.36%. This growth rate has significant contribution to increase SRR from 5.81% in 2007 to 9.5% in 2011. This ultimately contributed to increase maize productivity by 36% from 1.8 t/ha in 2000 to 2.2 t/ha in 2010 (HMRP, 2011).

### **Pre-sowing seed contract**

Establishment of an efficient seed production and marketing system ensures sustainability of any development initiatives. Various publications showed that ensuring seed marketing, HMRP-IV in 2013 initiated pre-sowing seed contracts of improved maize seed by signing a formal agreement between CBSP groups and seed traders (agrovets/ seed companies). In this initiative, the Tilottama Agriculture Cooperative Ltd., Pokharathok, Palpa, one of the CBSP groups of the HMRP- IV, signed such contract on the 5<sup>th</sup> February 2013 with Bhandari Agrovets, Tansen, Palpa for 2,000 kg seed of the improved maize varieties (Rampur Composite, Arun-2, and Manakamana-3) for 2013 maize season (Karoobar National Daily, 20 February 2013). This contract is believed to be the first in improved maize seed production in the hills of Nepal (KC, 2012). Analysis showed that the HMRP IV has facilitated the signing contracts for 170.45 tons of improved maize seeds of different varieties in 2013. Such contracts were signed between 50 CBSP groups and 24 seed traders in 2013 (HMRP, 2013) (Table 1).

**Table 1. Summary of pre-sowing maize seed contract, by seed seller and buyer (2013)**

Seed buyer (No.)	Seed seller (50 No.) (t)		Contracted quantity (t)	Share
	CBSP group (41)	Co-operative (9)		
Agrovets (18)	23.05	17.9	40.95	24%
Seed company (3)	37.00	42.0	79.00	46%
Cooperatives (2)	22.00	1.5	23.50	14%
Seed bank (1)	27.00	-	27.00	16%
Total (24)	109.05	61.4	170.45	100%
Share	64%	36%	100%	

Source. HMRP- IV (2013)

Analysis showed that Rampur Composite variety of maize shared highest proportion (42.2%) in total contracted volume followed by Arun-2 (26.5%) and least demanded variety was Manakamana-6 whose share remain only 0.2% of total volume. Surkhet district occupied highest share (29%) whereas lowest was in Okhaldhunga and Ramechhap district, each comprising 0.1% of total contracted seed volume (Table 3).

**Table 3. Summary of contracted seed volume, by district and variety (2013)**

District	Arun-2	Deuti	Manaka mana-3	Manaka mana-4	Manaka mana-6	Rampur Composite	Total (t)	% share
Acham			2.00				2.00	1.2%
Baglung						8.00	8.00	4.7%
Baitadi		4.00	6.00			9.50	19.50	11.4%
Dadeldhura	13.00	12.00				2.00	27.00	15.8%
Dailekh						4.00	4.00	2.3%
Dhading	3.80		1.00	3.00		9.00	16.80	9.9%
Dolkha	0.20	0.30				0.70	1.20	0.7%
Gulmi		1.00	2.50		0.30	0.60	4.40	2.6%
Jajarkot		2.00	8.00				10.00	5.9%
Kavre		3.10				7.60	10.70	6.3%
Okhaldhunga			0.10	0.05			0.15	0.1%
Palpa	0.50		1.00			0.50	2.00	1.2%
Ramechhap	0.10		0.10				0.20	0.1%
Sindhupalchowk		6.00				8.00	14.00	8.2%
Surkhet	27.50					22.00	49.50	29.0%
Syangja			1.00				1.00	0.6%
<b>Total (t)</b>	<b>45.10</b>	<b>28.40</b>	<b>21.70</b>	<b>3.05</b>	<b>0.30</b>	<b>71.90</b>	<b>170.45</b>	100.0%
<b>% share</b>	26.5%	16.7%	12.7%	1.8%	0.2%	42.2%	100.0%	

Source. HMRP- IV (2013).

### Acknowledgments

The author acknowledges the HMRP providing reference documents and researchers and farmers who participated and contributed during focused group discussion and key informant survey.

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