

<http://www.pjbs.org>

**PJBS**

ISSN 1028-8880

**Pakistan  
Journal of Biological Sciences**

**ANSI***net*

Asian Network for Scientific Information  
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

## Partial Budget Technique on Different Maize Intercropping Technologies Practised by the Farmers

S.M.A. Shiblee, A.F.M.F. Rahman, M. Kamruzzaman,  
P.C. Sarker, A. Muqit and M.A.A. Begum

Bangladesh Livestock Research Institute-(BLITI) Saver, Dhaka-1341, Bangladesh

**Abstract:** There were as many as eleven different maize intercropping technologies detected in the study area namely, Maize + Chilli, Maize + Chilli + Yard long bean, Maize + Chilli + Potato, Maize + Chilli, Maize + Chilli + Potato + Cucumber, Maize + Cow pea, Maize + Cucumber, Maize + Yard long bean + Cucumber, Maize + Sweet gourd and Maize + Sweet gourd + Tomato. It was found in the study that the highest MRR was received by the intercropping Maize + Chilli + Potato + Cucumber which was 598% and highest ARR was received by Maize + Cucumber intercropping which was 391%. Based on ARR and MRR, intercropping Maize + Cucumber, Maize + Chilli + Potato + Cucumber should be recommended to the farmers for their adoption.

**Key words:** Maize intercropping, marginal rate of return (MRR), average rate of return (ARR)

### Introduction

In Bangladesh, the demand of food will continue to increase, as its population increases by nearly 2.3 million every year. Demand of food of ever increasing population of our country cannot be fulfilled only by rice and wheat (Bangladesh Rice Research Institute, 1997). Now, there is a consensus that striving to augment the production of rice and wheat, cultivation of maize should be increased simultaneously, because of its high yield potential yielding twice as much than rice and wheat-physiological adaptability to diverse agro-climatic situations. Maize occupies the second position in the total production of cereal crops and its yield is highest than any other cereal crops in the world. Maize contains more protein than that of rice and fat, phosphorus and carotene than those of wheat. But maize remains to be a very insignificant crop till today in Bangladesh. So it would be wise to disseminate maize through the technology of inter-cropping with other main crop rather than attempting to disseminate it as a sole crop. The reason behind it is that farmers will not have any objection to cultivate maize as intercropping with other main crop, if it does not significant harm to other main crop besides, intercropping with other main crop rather than attempting to disseminate it as a sole crop. The reason behind it is that farmers will not have any objection to cultivate maize as intercropping with other main crop, if it does not produce significant harm to other main crop. Besides, intercropping practise aims to (1) insure against total crop failures under aberrant weather conditions or pest epidemics (2) increase total productivity per unit land area, and (3) equitably and judiciously utilise land resources and farming inputs, including labour. With this end in view, the present study was undertaken to learn about the existing maize intercropping technologies practised by the farmer in order to help research to develop appropriate program concerning maize intercropping technologies. It may be mentioned here that so far as we know, no survey was conducted previously in respect of maize intercropping.

**Objectives of the study:** The specific objectives of the study were:

1. To identify different maize intercropping technologies practised by the farmers

2. To evaluate the performance of different maize intercropping for identification of the most productive/profitable maize intercropping
3. To identify the constraints confronted by the respondent farmers and suggest policies for the enhancement of maize intercropping

### Materials and Methods

Multi location testing (MLT) site of Fatikchhari thane of Chittagong District falling in the Chittagong coastal plain agro-ecological zone (AEZ-23) was selected purposively for the study which was conducted during April-May 1999 for the rabi period of 1998-1999. Simple random sampling technique was applied in choosing the sample farmers. A total of 7.5 farmers were interviewed by using pre-designed questionnaire. The collected data were edited, summarised and analysed in order to achieve the various objectives of the study.

**Partial-Budget Technique:** Partial budget technique comprising dominance and marginal analysis is a powerful tool in finding out either one or two most profitable enterprises among the different enterprises. In this paper, this technique was used in the different maize intercropping technologies. The following criteria were used in the application of partial budget technique (Elias and Karim, 1984).

**Gross return (GR):** Gross return is calculated by multiplying yield with the price of the product.

**Total variable cost (TVC):** This refers to the summation of all variable costs, -such as cost of human labour, cost of animal labour, cost of seed/seedling, cost of manures, cost of fertilizers, cost of insecticides, cost of irrigation, and interest on opportunity cost of operating capital. Only full cost basis was considered in calculating cost. Full cost included the cost of all inputs used whether it was purchased or not.

**Gross margin (GM):** Gross margin is calculated by deducting the total variable cost from the Gross return.

**Marginal rate of return (MRR):** This is calculated for the

## Shiblee *et al.*: Partial budget techniques on Maiz intercropping technologies

maize intercropping, say X, as:

$$\frac{\text{Marginal gross margin}}{\text{Marginal gross cost}} \times 100$$

where, marginal gross margin (MGM) refer to the additional increase in gross margin of the maize intercropping and marginal gross cost (MGC) refer to the additional increase in the gross cost due to maize intercropping change.

**Average rate of return (ARR):** This is calculated for the maize intercropping, say maize intercropping X, as the difference of gross margin of the maize intercropping X and the gross margin of the maize intercropping having lowest gross margin multiplied by 100 divided by the difference of gross cost of the maize intercropping X and the gross cost of the maize intercropping having lowest gross margin.

### Results and Discussion

Existing maize intercropping technologies identified in the study area: There were as many as eleven different maize intercropping detected in the study area, namely, maize + Chilli, maize + Chilli + Yard long bean, maize + Chilli + Potato, Maize + Chilli + Potato + Cucumber, Maize + Chilli + Sweet gourd, Maize + Chilli + Sweet gourd + Potato + Cucumber, Maize + Chilli + Sweet ground, Maize + Chilli + Sweet gourd + Potato, Maize + Cow pea, Maize + Cucumber, Maize + Yard long bean + Cucumber, Maize + Sweet gourd + Tomato (Rahman and Amin, 1988).

**Total variable cost:** Total variable cost computed for the intercropping of maize + Chilli, maize + Chilli + Yard long bean, Maize + Chilli + Potato, Maize + Chilli + Potato + Cucumber, Maize + Chilli + Sweet gourd, Maize + Chilli Sweet gourd + Potato, Maize + cow Pea, Maize + Cucumber, Maize + Yard long bean + Cucumber, maize + Sweet gourd and maize + sweet gourd + Tomato were take 45389, 48914, 48914, 47101, 41701, 37690, 54705, 41360, 52738, 56321, 27093 and 44376, respectively (Table 1). It is observed that maize + Yard long bean + Cucumber incurred the highest cost followed by maize + sweet gourd + chilli potato and maize + sweet gourd incurred lowest cost preceded by maize + chilli + sweet gourd intercropping (Chowdhury, 1993).

**Total return and gross margin:** it was found in the study area that total return for the intercropping maize + chilli, maize + chilli + yard long bean, maize + chilli + Potato, maize + chilli + Potato + Cucumber, maize + chilli + sweet gourd, maize + chilli + sweet gourd + Potato, maize + cow pea, maize + cucumber, maize + Yard long bean + cucumber, maize + sweet gourd and maize + sweet gourd + tomato were take 61981, 55472, 62759, 97710, 69160, 61750, 54340, 167445, 158080, 39520 and 50553, respectively. Gross margin was take 16591, 658, 15657, 56009, 31470, 7045, 12980, 114707, 101759, 12427 and 6177, respectively, for the aforementioned intercropping (Table 1).

**Comparison of Economic Efficiency Applying Partial Budget Technique:** Partial budget technique has two sequential parts, first one is doance analysis and second one is marginal analysis.

**Dominance analysis:** Gross margin of different maize intercropping have been arranged in descending order with their corresponding costs in the Table 2 as per dominance analysis rule in order to find out the cost dominated intercropping technologies with a view to eliminating it from the marginal analysis. Cost dominated intercropping is that intercropping which cost is higher, but return is less than that of an alternative intercropping. Obviously, a rational farmer will not select any cost dominated intercropping. It was found in

Table 1: Per hectare total variable cost, total return and gross margin of different maize intercropping technologies practised by the farmers

Name of Different Maize Intercropping	Total variable cost (Taka)	Total variable cost (Take)	Gross margin (Taka)
Maize + Chilli	45389	61981	16591
Maize + Chilli + Yard long bean	48914	55472	6558
Maize + Chilli + Potato	47101	62759	15657
Maize + Chilli + Potato + Cucumber	41701	97710	56009
Maize + Chilli + Sweet gourd	37690	69160	31470
Maize + Chilli + Sweet gourd + Potato	54705	61750	7045
Maize + Cow pea	41360	54340	12980
Maize + Cucumber	52738	167445	114707
Maize + Yard long bean + Cucumber	56321	158080	101759
Maize + Sweet gourd	27093	39520	12427
Maize + Sweet gourd + Tomato	44376	50553	6177

Total variable costs refers to the summation of all variable costs, such as cost of human labour, cost of animal labour, cost of seed/seedling, cost of manures, cost of fertilizers cost of insecticides, cost of irrigation and interest on opportunity cost of operating capital

Table 2: Dominance analysis of the different maize intercropping technologies

Name of different Maize intercropping	Gross margin (Taka)	Total variable cost (Take)	Cost dominated (CD), Cost undominated (CUD)
Maize + Cucumber	114707	52738	
Maize + Yard long bean + Cucumber	101759	56321	CD
Maize + Chilli + Potato + Cucumber	56009	41701	CUD
Maize + Chilli + Sweet gourd	31470	367690	CUD
Maize + Chilli	16591	45389	CD
Maize + Chilli + Potato	15657	47101	CD
Maize + Cow pea	12980	41360	CD
Maize + Sweet gourd 12427	27093	CUD	
Maize + Chilli + Sweet gourd + Potato	7045	54705	CD
Maize + Chilli + Yard long bean	6558	48914	CD
Maize + Sweet gourd + Tomato	6177	44376	CD

Table 3: Marginal analysis of different maize intercropping technologies

Name different maize intercropping	Gross margin (Taka)	Total variable cost (Taka)	MGM (Taka)	MGC (Taka)	MRR (%)	ARR (%)
Maize + Cucumber	114707	52738	58698	11037	532	399
Maize + Chilli + Potato + Cucumber	56009	41701	24539	4011	612	298
Maize + Chilli + Sweet gourd	31470	37690	19043	10597	180	180
Maize + Sweet gourd	12427	27093				

GM = Gross margin  
MGM = Marginal gross margin  
MRR = Marginal rate of return

TVC = Total variable cost  
MGC = Marginal total variable cost  
ARA = Average rate of return

that maize + yard long bean + cucumber, maize + chilli, maize + chilli + potato, maize + cowpea, maize + chilli + sweet gourd + potato, maize + chilli + Yard long bean and maize + sweet gourd + tomato were cost dominated, so the above intercropping can be discarded from the marginal analysis table.

**Marginal analysis:** As capital is a scarce resource, farmers always strive to spend cash to that extent where return to this investment is highest. Marginal analysis shows that

## Shiblee *et al.*: Partial budget techniques on Maiz intercropping technologies

marginal rate of return on investment. it reveals how the return increases as the amount of investment increase. Having disposed of the cost dominated intercropping marginal analysis was carried out for the remaining four cost undermined intercropping and their marginal increase in gross margin, marginal increase in gross cost, marginal

Table 4: Farmer's view about some constraints in maize

Intercropping technologies Constraiant	Respondent farmer's %age
Destruction of maize by bird and animal	100
Marketing problem	86
Lack of modern technology	82
Minimum idea about maize cultivation	80
Threshing is difficult and time consuming	76
Want of quality seed	68
Maize food habit is low	68
price is low than desired	60
Pest infestation during seedling age.	52

Table 5: Steps should be taken to enhance maize intercropping technologies as envisaged by the farmer

Steps	Respondent farmer's %age
Ensuring marketing	82
Extension work syhould be done to create eagerness	72
Provision of training	70
Ensuring quality seed supply	66
Modern implement should. be.supplied	64
Benefit should be informed to the farmers	60
Farmers should be organised	56
Making farmers known to the versatile use of maize	48

rate of return and average rate of return were shown in marginal analysis (Table 3). From the Table 3, it was found that the highest MRR was received by the intercropping maize + chilli + Potato + cucumber which was 598%, denoting that if the farmers invests additional one hundred take in the maize + chilli + Potato + Cucumber intercropping over the maize + chilli + sweet gourd intercropping they can get additional take 598 from his additional investment. The highest ARR was received by maize + cucumber intercropping which was 391%, connoting that if the farmers switch over the maize + cucumber intercropping instead of the maize + sweet gourd intercropping, they will be able to earn an additional income of take 391 by spending extra one hundred take. So, if the farmers adopt maize + chilli + Potato + cucumber and Maize + cucumber intercropping, it will give the farmers maximum rate of return to capital. Based on MRR, intercropping maize + chilli + Potato + cucumber and based: on ARR., intercropping maize + cucumber should be recommended to the farmers for their adoption.

farmer's view about some constraints in maize intercropping technologies: Economic emancipation of the farmers to a great extent depend on resorting appropriate measures based on prioritising problems as envisaged by the farmers. Respondent farmers viewed nine problems (Table 4) in practising maize intercropping. which are shown below according to highest to lowest rank.

Destruction of maize by bird and animal (respondent by 100% farmer), marketing problem (86%), Lack of modern technology (82%), minimum idea about maize cultivation (80%), threshing is difficult and time consuming (76%), want to quality seed (68%), maize food habit is low (68%) price is low than desired 160%1, pest infestation during seedling age (52%).

### Steps to be taken to Augment maize intercropping technologies:

Respondent farmers apprised about some measures as to how to increase maize intercropping technology shown in Table 5. Measures as suggested by the farmers were: Ensuring marketing (82%), extension work should be done to create eagerness (72%). Provision of training (70%), ensuring quality seed supply (66%), modern irnlement should be supplied (64%), benefit should be informed to the farmers (60%), farmers should be organised (56%) and making farmers known to the versatile use of maize (48%).

It is suggested that researchers and policy makers develop their future research program and take measures concerning maize intercropping technologies by giving priority to the farmers opinion.

### References

- Bangladesh Rice Research Institute, 1997. Bangladesh rice research institute serving the nation. Bangladesh Rice Research Institute, Joydebpur, Gazipur, pp: 4.
- Chowdhury, S.A., 1993. Intercropping of bitter gourd with different maize population. Research Report (1992-93). On Farm Research Division. Regional Agricultural Research Station, Hathazari, Chtttagong, pp: 1.
- Elias, S.M. and M.R. Karim, 1984. Application of partial budget technique on cropping system research at Chittagong. Division of Agricultural Economics, BAAI., Gazipur, pp: 3.
- Rahman A.F.M.F. and M. Amin, 1988. Four maize varieties intcropped with chilli at different population. Research report (1987-88). On-Farm Research Division, Regional Agricultural Research Station, Hathazari, Chittagong, pp: 38-39.