Sustainability of Scientific Maize Cultivation Practices in Haryana

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ABSTRACT

Sustainability of scientific maize cultivation practices must be ensured to attain the goal of agricultural sustainability. The study was conducted in purposively selected state i.e. Haryana. A total sample size of 80 maize farmer respondents and 20 SMS/ Experts were selected by using multi-stage random sampling technique and simple random selection procedure respectively. Data were collected by using personal interview method. The collected data were tabulated, analyzed and interpreted with the help of appropriate statistical tools. Among the practices studied in scientific maize cultivation, mean sustainability scores obtained from farmer respondents was highest for irrigation followed by application of FYM, use of HYV and application of synthetic nitrogenous fertilizer respectively. The experts perceived significantly higher sustainability in all practices.

Key words : *Maize; Sustainability; High yielding varieties (HYV); Farm yard manure (FYM); Synthetic nitrogenous fertilizer; Irrigation*

Estimates indicate that Indian population will require 325 million tonnes of foodgrain by 2020 AD. This demands consistent increase in production and productivity of agricultural crops. Maize has immense potential to meet food requirement of human population. It has a great significance as human food, animal feed and diversified uses in a large number of industrial products.

Adoption of improved and sustainable maize technologies holds the key to ensure both sustainability and increased maize production. Dr. M.S. Swaminathan (1995) identified 14 major dimensions of sustainable agriculture; and according to him, sustainable agricultural technology should be technologically appropriate, economically feasible and viable, environmentally sound, stable over the long run, efficient in resource use, locally adaptable, socially acceptable and sustainable, implementable in existing political set-up and bureaucratic structure, culturally desirable, renewable, equitable and productive. There is report of sustainability concerns and emerging problems in Haryana. A study by MSSRF Centre for Research on Sustainable Agricultural and Rural Development (Circa, 2005) revealed that over-exploitation of groundwater has threatened agricultural sustainability. Generally *rabi* maize is not grown. Few farmers are growing *kharif* maize. Haryana account for 0.24% of total *kharif* maize area and 0.28% of total *kharif* maize production in India with productivity of 21.25 q/ha during same period (Anonymous, 2005-06). Many farmers cultivated *kharif* maize around 5 to 10 years back, but gradually, it was replaced by paddy cultivation.

The area, production and productivity of maize in Haryana have decreased during the last few years (Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Govt. of India). Sustainability of scientific maize cultivation practices in Haryana had not been studied, so far. Thus, keeping in view, the importance of scientific maize cultivation practices and decreasing trend of area, production and productivity, the present study was undertaken, with the specific objectives given as below:

1. To measure and compare the degree of sustainability of scientific maize cultivation practices in Haryana.
2. To ascertain the perceptual difference, if any, among SMS/experts and farmers regarding various dimensions of sustainability with respect to scientific maize cultivation practices.

METHODOLOGY

The study was conducted in Haryana during 2005. Two progressive districts in terms of agricultural development, i.e., Karnal and Kurukshetra were purposively selected. Then, two blocks from each selected district; and from each block, two villages; and from each village, 10 farmers were selected by using multi-stage

random sampling technique, thereby constituting a sample-size of 80 farmer respondents. Those farmers growing maize were considered as potential respondents. Twenty SMS/ experts working in the study area were also selected using simple random selection procedure. Technologies recommended by scientists of particular region become scientific practice, when it is in regular use by farmers. Based on review of literature and experts' advice four important scientific maize cultivation practices, namely; use of high yielding varieties(HYV), application of farm yard manure(FYM), application of synthetic nitrogenous fertilizer and irrigation were selected.

Degree of sustainability of selected scientific maize cultivation practices was operationalized as the perceived extent up to which selected practices were technologically appropriate, economically viable, environmentally sound, socio-culturally compatible, stable over long period of time, efficient in resource use, productive, locally adaptable, equitable and government policy in favour of its implementation. A suitable sustainability index was developed to measure extent of sustainability of selected practices. Index was developed by using ten dimensions and twenty-two indicators of sustainability. Responses were taken from both farmers as well as expert respondents on three-point continuum, i.e., agree, undecided and not agree. Score two (2) for agree, one (1) for undecided and zero (0) for not agree were given. Total obtained score for each selected practice was calculated. It was divided by number of respondents, which gave mean sustainability score. Dimension-wise mean sustainability scores were also calculated. For a total of ten dimensions of sustainability, the maximum possible mean score of sustainability were 44 for each of four scientific maize cultivation practices considered under the present study. Mean sustainability scores were calculated for each selected practice against all ten dimensions and twenty-two indicators and were analyzed by using 'Z' test.

RESULTS AND DISCUSSION

Among the practices studied, mean sustainability scores obtained from farmer respondents was highest in irrigation, followed by application of FYM, application of synthetic nitrogenous fertilizer and use of HYV, respectively. Expert respondents perceived highest sustainability for application of FYM, followed by irrigation, application of synthetic nitrogenous fertilizer and use of HYV respectively (Table 1). The sustainability of all the selected practices was found to be perceived differentially by SMS/experts and the farmers. The experts reported higher sustainability of all practices. Both farmers and experts were of the opinion that use of HYV was least sustainable among selected practices. Difference in opinion of farmers and experts was mainly due to difference in educational background coupled with their respective professional interests: experts are the technology generators/ disseminators; whereas farmers are the actual users of technology.

Table 1. Sustainability of scientific maize cultivation practices in Haryana

Respon dents	Mean Sustainability Score of Practices			
	Use of HYV	Application of FYM	Application of Synthetic Nitrogenous Fertilizer	Irrigation
Farmers (N=80)	26.22	31.89	26.78	32.0
Experts (N=20)	28.65	35.50	29.20	35.0
Z-value	2.01*	10.92**	2.35*	2.53*

*Significant at 0.05 level of probability.
** Significant at 0.01 level of probability.

Results of dimension-wise sustainability analysis of selected scientific practices of maize cultivation have been presented below:

Sustainability of use of high yielding varieties (HYVs) : Dimension-wise analysis (Table 2) of sustainability indicates that use of HYV in maize cultivation was more socio-culturally compatible, technologically appropriate and stable, but insufficient government support (e.g., availability of quality seed at cheaper price on right time from government agency or Beej Nigam) and less economically viable.

Table 2. Dimension-wise sustainability of use of HYVs

S No	Dimensions of Sustainability	Maximum possible sustainability score	Haryana	
			Farmers (N=80)	Experts (N=20)
1.	Technological appropriability	6	4.89	5.05
2.	Economic viability	6	2.89	3.60
3.	Environmental soundness	4	2.44	2.60
4.	Socio-cultural compatibility	4	3.56	3.50
5.	Stability	4	3.11	3.00
6.	Resource-use-efficiency	4	2.22	2.90
7.	Productivity	4	2.22	2.40
8.	Local adaptability	4	2.00	2.20
9.	Equity	4	2.00	2.30
10.	Government policy	4	0.89	1.10
	Overall	44	26.22	28.65

All in all, the sustainability of use of HYV in maize cultivation was less, which might be due to less use of HYV seed, less yield, meagre profit, less suited to need and aspiration of people, less technical knowledge, lack of quality produce and lack of proper marketing facility.

Thus, it may be suggested that extension agencies should impart technical knowledge about improved HYV of maize, government should ensure timely availability of HYV seed to farmers at cheaper price, and proper marketing facility should be established for improving sustainability of HYV in maize cultivation.

Sustainability of application of Farm Yard Manure (FYM) : FYM maintains physical structure of soil. Farmers were applying FYM as per its availability. Table 3 reveals that application of FYM in maize cultivation was found more environmentally sound, stable and socio-culturally compatible, but less equitable. Farmer and expert respondents were widely varying in their responses regarding government policy. Farmers were expecting more government support in increasing availability of FYM. But experts classified and opined that government has very limited role in increasing availability of FYM. Government is supporting application of FYM through various training programmes on integrated nutrient management (INM). Farmers should adopt improved method of composting like NADEP method, which increases amount of manure from same amount of dung. Researches should be conducted for rapid decomposition of dung, prevention of loss of nutrients in decomposition process, etc.

Table 3. Dimension-wise sustainability of application of FYM

S No	Dimensions of Sustainability	Maximum possible sustainability score	Haryana	
			Farmers (N=80)	Experts (N=20)
1.	Technological appropriability	6	4.89	5.40
2.	Economic viability	6	3.44	3.70
3.	Environmental soundness	4	4.00	4.00
4.	Socio-cultural compatibility	4	3.56	3.60
5.	Stability	4	4.00	4.00
6.	Resource-use-efficiency	4	3.11	3.30
7.	Productivity	4	3.56	3.70
8.	Local adaptability	4	2.89	3.00
9.	Equity	4	1.78	2.00
10.	Government policy	4	0.67	2.80
	Overall	44	31.89	35.50

Sustainability of application of synthetic nitrogenous fertilizer : Dimension-wise analysis presented in Table 4 showed that application of synthetic nitrogenous fertilizer in maize cultivation was more socio-culturally compatible, equitable and economically viable, but less environmentally sound and equitable. Farmers were using fertilizer without soil test. Indiscriminate use of fertilizer making this practice less environmentally sounds. Differences in opinion of farmer and expert respondents were found. They were varying mainly on utilization efficiency of urea, risk involved in imbalanced use of synthetic nitrogenous fertilizer, accessibility of urea and technical assistance to all farmers.

Table 4. Dimension-wise sustainability of application of synthetic nitrogenous fertilizer

S No	Dimensions of Sustainability	Maximum possible sustainability score	Haryana	
			Farmers (N=80)	Experts (N=20)
1.	Technological appropriability	6	5.33	5.40
2.	Economic viability	6	4.89	4.90
3.	Environmental soundness	4	0.67	0.40
4.	Socio-cultural compatibility	4	3.78	3.80
5.	Stability	4	1.78	2.10
6.	Resource-use-efficiency	4	1.89	2.10
7.	Productivity	4	2.44	2.80
8.	Local adaptability	4	2.11	2.70
9.	Equity	4	1.78	2.50
10.	Government policy	4	2.11	2.50
	Overall	44	26.78	29.20

Table 5. Dimension-wise sustainability of irrigation

S No	Dimensions of Sustainability	Maximum possible sustainability score	Haryana	
			Farmers (N=80)	Experts (N=20)
1.	Technological appropriability	6	4.78	5.30
2.	Economic viability	6	4.11	4.80
3.	Environmental soundness	4	2.22	2.90
4.	Socio-cultural compatibility	4	3.56	3.60
5.	Stability	4	3.56	3.70
6.	Resource-use-efficiency	4	2.67	2.70
7.	Productivity	4	2.22	2.60
8.	Local adaptability	4	2.89	3.20
9.	Equity	4	3.11	3.20
10.	Government policy	4	2.89	3.00
	Overall	44	32.00	35.00

Sustainability of irrigation : Table 5 reveals that mean sustainability scores of irrigation in maize cultivation obtained from farmer and expert respondents were found to be 32.00 and 35.00, respectively. Significant differences were found out between responses obtained from farmers and experts. The experts reported higher sustainability of irrigation. Dimension-wise analysis (Table 5) indicated that irrigation in maize cultivation satisfies most of the dimensions of sustainability. It was found more socio-culturally compatible, stable and technologically appropriate but less environmentally sound, productive and efficient in resource use.

CONCLUSION

Among the practices studied in scientific maize cultivation, mean sustainability scores obtained from farmer

respondents was highest in irrigation, followed by application of FYM, application of synthetic nitrogenous fertilizer and use of HYV respectively. Expert respondents perceived highest sustainability in application of FYM followed by irrigation, application of synthetic nitrogenous fertilizer and use of HYV respectively. The sustainability of all the selected practices was found to be perceived differentially by SMS / experts and the farmers. The experts reported higher sustainability of practices. Timely availability of quality seed, use of vermicompost, govt. control on supply, quality and cost of fertilizer and reduction in cost of irrigation were the important suggestions as given by the farmers to improve sustainability regarding use of HYV, FYM, synthetic nitrogenous fertilizer and irrigation respectively.

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