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Sustainability of Scientific Maize Cultivation Practices in Uttar Pradesh, India

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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. Uttar Pradesh. 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. Estimates indicate that Indian population will require 325 million tons of food grain 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. Muthuran (1995) cited 14 major dimensions of sustainable agriculture as identified by M.S. Swaminathan 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 Uttar Pradesh. In Uttar Pradesh, farmers find it difficult to sustain their living standards due to small holding, less infrastructural facility, etc. Maize “The queen of cereals” is the third most important food crop in Uttar Pradesh next only to rice and wheat. Kharif maize is an important crop. Concept of cultivating the “rabi maize” was originated in this state and it is grown in a sizeable area. Uttar Pradesh account for 8.33% of the total maize area and 9.65% of total maize production in the country with an average yield of 23.74 q/ha during 2003-04. Sustainability of scientific maize cultivation practices in Uttar Pradesh had not been studied, so far. Thus, keeping in view, the importance of scientific maize cultivation practices and decreasing trend of 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 Uttar Pradesh.

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.

Keyword- sustainable maize, cultivation, high yielding. Varieties.

Methodology

The study was conducted in two progressive districts of Uttar Pradesh Patna and Begusarai (purposively selected).

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 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 operational zed as the perceived extent up to which selected practices were technologically appropriate, economically viable, environmentally sound, socio-culturally compatible, and stable over long period of time, efficient in resource use, productive, locally adaptable, and equitable and government policy in favor 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 discussions

Among the practices studied, mean sustainability scores obtained from farmer respondents was highest in irrigation, followed by application of FYM, use of HYV and application of synthetic nitrogenous fertilizer, 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. Mean sustainability scores obtained from experts respondents were highest in application of FYM followed by irrigation, use of HYV and application of synthetic nitrogenous fertilizer respectively. Both farmer and experts were of the opinion that application of synthetic nitrogenous fertilizer 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.

1. Sustainability of use of high yielding varieties (HYVs)

Dimension-wise analysis (Table 2) of sustainability indicates that use of HYVs was more socio-culturally compatible, technologically appropriate, stable, efficient in resource use and productive, but government support is insufficient (e.g., no availability of quality seed at cheaper price on right time from government agency or Beej Nigam) and less economically viable.

Sustainability scores obtained from experts were found to be higher in most of the dimensions except socio-cultural compatibility, stability and local adaptability. Few experts were of the opinion that HYVs are not suited to needs and aspirations of few sections of the farming community. Results of dimension-wise sustainability analysis of selected scientific practices of maize cultivation have been presented below:

2. Sustainability of application of Farm Yard Manure (FYM)

FYM maintains physical structure of soil. Farmers were applying FYM as per its availability. Application of FYM in maize cultivation was found more environmentally sound, stable, socio-culturally compatible, productive, and technologically appropriate but less equitable, locally adaptable and economically viable.

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 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.

3. 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, technologically appropriate, productive and economically viable, but less environmentally sound and equitable. Farmers were using fertilizer without soil test. They were applying higher dose of urea for getting same yield level. Indiscriminate use of fertilizer making this practice less environmentally sounds. Differences in the opinions of farmers and expert respondents were mainly on utilization efficiency of urea, risk involved

4. Sustainability of irrigation

Generally, kharif maize cultivation is rained but rabi maize is irrigated. Dimension-wise analysis indicated that irrigation in maize cultivation satisfies most of the dimensions of sustainability. It was found more socio-culturally compatible, stable and technologically appropriate. It was found to be less equitable. It indicates that irrigation facility is

Not available to all farmers. Both farmer and expert respondents stated regarding lack of government support for establishing irrigation infrastructure, like, canal irrigation, electricity operated pump-sets, etc. It is suggested that irrigation at critical stages of crop growth must be ensured in all seasons for getting higher yield and improving sustainability of irrigation as well as overall maize cultivation. Of HYV and application of synthetic nitrogenous

fertilizer, respectively, whereas, mean sustainability scores obtained from expert respondents was highest in application of FYM, followed by irrigation, use of HYVs and application of synthetic nitrogenous fertilizer 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, reduction in cost of irrigation and govt. control on supply, quality and cost of fertilizer were the important suggestions as given by the

Farmers to improve sustainability regarding use of HYV, FYM, irrigation and synthetic nitrogenous fertilizer, respectively

Conclusion

Among the practices studied in scientific maize cultivation, mean sustainability scores was highest in irrigation, followed by application of FYM, use of HYV and application of synthetic nitrogenous fertilizer, respectively, whereas, mean sustainability scores obtained from expert respondents was highest in application of FYM, followed by irrigation, use

Of HYVs and application of synthetic nitrogenous fertilizer 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, reduction in cost of irrigation and govt. control on supply, quality and cost of fertilizer were the important suggestions as given by the farmers to improve sustainability regarding use of HYV, FYM, irrigation and synthetic nitrogenous fertilizer, respectively.

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Table 1. Sustainability of scientific maize Cultivation practices in Uttar Pradesh

Respond-Dents	Mean Sustainability Score of Practices			
	Use of HYV	Application of FYM	Application synthetic nitrogenous fertilizer	Irrigation
Farmers (N=80)	30.44	31.65	26.49	32.26
Experts (N=20) \	31.80	34.50	28.10	33.60
Z-value	2.13*	7.87**	3.07**	2.65**

* Significant at 0.05 level of probability.

** Significant at 0.01 level of probability.

Table 2. Dimension-wise sustainability of use of HYVs

S. No.	Dimensions of Sustainability	Maximum possible sustainability score	Uttar Pradesh Farmers (N=80)	Uttar Pradesh Experts (N=20)
1.	**Technological appropriability**	**6**	**5.65**	**5.70**
2.	**Economic viability**	**6**	**3.12**	**4.00**
3.	**Environmental soundness**	**4**	**2.39**	**2.50**
4.	**Socio-cultural compatibility**	**4**	**3.93**	**3.80**
5.	**Stability**	**4**	**3.23**	**3.20**
6.	**Resource-use-efficiency**	**4**	**3.11**	**3.40**
7.	**Productivity**	**4**	**3.05**	**3.10**
8.	**Local adaptability**	**4**	**2.53**	**2.50**
9.	**Equity**	**4**	**2.46**	**2.50**
10.	**Government policy**	**4**	**0.98**	**1.10**
Overall		**44**	**30 .44**	**31.80**

Table 3 Dimension-wise sustainability of application of FYM

S. No.	Dimensions of Sustainability	Maximum possible sustainability score	Uttar Pradesh Farmers (N=80)	Uttar Pradesh Experts (N=20)
1.	Technological appropriability	6	5.16	5.30
2.	Economic viability	6	3.60	3.70
3.	Environmental soundness	4	3.96	4.00
4.	Socio-cultural compatibility	4	3.82	3.80
5.	Stability	4	4.00	4.00
6.	Resource-use-efficiency	4	3.09	3.30
7.	Productivity	4	3.65	3.70
8.	Local adaptability	4	2.11	2.00
9.	Equity	4	1.63	1.90
10.	Government policy	4	0.63	2.80
	Overall	44	31.65	34.50