

Matrix Ranking of the Technological Interventions Perceived by Farmers under IVLP

Anuj Kumar¹, Ram Chand², R.M. Fulzele³ and Randhir Singh⁴

Introduction

Indian agriculture supports about 65 per cent of its total population and contributes about 22 per cent to GDP. It is the mainstay of India's rural economy and contributes significantly towards employment and income generation. It is realized that 2/3rd of the technologies do not percolate to the actual beneficiaries as they are developed without taking into consideration their socio-economic and psychological status. Since independence, several technologies have evolved for increasing the production, productivity of the crop as well as animals by improving the adoption behaviour of the farmers (Dwivedi *et al.*, 2004).

Client oriented research and technology development to improve productivity; sustainability and equity are the fundamentals of Technology Assessment and Refinement through Institute Village Linkage Programme (TAR-IVLP), which has given a new dimension to extension strategies. The stakeholders are also partners in the technology development and assessment process (Anonymous, 2004). Under this programme a large number of technologies suitable for different micro farming situations have been assessed and some of them refined with the active participation of the farmers. In this paper an effort has been made to gauge the technological interventions through farmers' opinion about the reasons for adoption, discontinuance and rejection.

¹ Scientist (Agril. Extn.), Directorate of Wheat Research, Karnal, Haryana,

² ADG (KVK), ICAR, Pusa Campus, New Delhi

³ Principal Scientist (Dairy Extension Education), NDRI, Karnal, Haryana

⁴ Senior Scientist (Agril. Extn.), Directorate of Wheat Research, Karnal, Haryana

Research Methodology

Locale of the Study

The study was carried out at two centres of TAR-IVLP namely; NDRI, Karnal representing Irrigated Agro Eco-system in Karnal district of Haryana and IGFRI, Jhansi, representing Rainfed Agro Eco-system. The villages of IGFRI, Jhansi are located in Shivpuri district of Madhya Pradesh (MP). These two centres were selected purposively to have more number of interventions related to crops and dairying.

Design of the Study

Ex-post facto research design, is formulated for this study. In this design, participants who receive the interventions are compared to themselves before and after receiving the interventions.

Selection of Villages

All the five villages namely, Gaurgarh, Amargarh (Kala Majra), Sikri, Shekhpura and Gumto of Karnal district were selected for the study under irrigated agro eco-system. Since 1995 these villages have been adopted by National Dairy Research Institute, Karnal under TAR-IVLP project. Under rainfed agro eco-system all the adopted villages of IGFRI, Jhansi namely, Algi, Sanora and Garera and their hamlets of district Datia/Shivpuri of MP were selected purposively for the study. Since 1999 - 2000 the TAR-IVLP project has been implemented in rainfed agro eco-system. In these villages a number of technological interventions related to crop production and dairying have been assessed and refined.

Selection of Respondents

From irrigated agro eco-system 75 farmers were selected randomly, fifteen from each of the five villages. Similarly, 75 farmers were selected from the rainfed agro eco-system. Hence, from each village and their hamlets a total of 25 farmers were interviewed for the present study, making the sample size 150.

Matrix Ranking

Matrix ranking was done for technological interventions in crop production, dairying and fodder production to know the farmers' views about the technologies and reasons for adoption and discontinuance. Through matrix ranking the technologies were ranked on a set of parameters, which farmers think are important for selection of a technology and its adoption in real farm situation.

Results and Discussion

I. Irrigated Agro Eco-system

a. Matrix Ranking for Adoption of Crop Production Interventions

Under irrigated agro eco-system, among the improved paddy varieties, PR 116 variety was ranked first followed by Pusa 44. Except in yield, PR 116 was preferred over Pusa 44 for all the parameters (Table 1). Among the varieties of basmati paddy, Pusa 1121 was the most preferred one (Table 2). Though there was shattering of grains at the time of harvesting in Pusa 1121, it outperformed CSR 30 in terms of per hectare yield and income. Matrix ranking of improved varieties of wheat was done for all the conditions viz., timely sown, late sown and saline alkaline soil, and it was observed that PBW 343 out performed HD 2687 (Table 3), but both the varieties were found equally good for North Western Plains Zone (NWPZ). Under late sown condition, PBW 373 was ranked first followed by Raj 3765, PBW 226 and UP 2425 at II, III and IV ranks respectively (Table 4). KRL1-4, and KRL19 were most suitable for saline alkaline soil (Table 5). Both the varieties were a boon for problematic soil and farmers were able to harvest good yield. KRL1-4 was preferred over KRL19 in the villages.

Table: 1. Adoption of improved paddy varieties in irrigated agro eco-system

Reasons	Varieties			
	Pusa 44	PR 114	PR 116	HRK 126
More yield	I	III	II	IV
More income	II	IV	I	III
Disease resistance	II	III	I	IV
More market price	IV	II	I	III
Overall	II	III	I	IV

Table: 2. Adoption of improved paddy varieties in irrigated agro eco-system (basmati)

Reasons	Rank	
	CSR 30	Pusa 1121
More yield	II	I
More income	II	I
Disease resistance	I	I
More market price	I	II
Shattering of grains	-	I
Overall	II	I

Table: 3. Adoption of improved wheat varieties (timely sown) in irrigated agro eco-system

Reasons	Rank	
	CSR 30 BW 343	Pusa 1121 HD 2687
More grain yield	I	II
More straw yield	I	II
More income	I	II
Disease resistance	I	II
Better grain quality	I	II
More market price	II	I
Overall	I	II

Table: 4. Adoption of improved wheat varieties (late sown) in irrigated agro eco-system

Reasons	Rank			
	PBW 373	PBW 226	Raj 3765	UP 2425
More yield	I	III	II	IV
More yield	I	III	II	IV
More income	I	III	II	IV
Disease resistance	I	II	III	IV
More market price	II	IV	III	I
Overall	I	III	II	IV

Table: 5. Adoption of improved wheat varieties suitable for sodic soil in irrigated agro eco-system

Reasons	Rank	
	KRL 1-4	KRL 19
More yield	I	II
More income	I	II
Overall	I	II

The overall ranking was done for all the interventions related to crop production for their impact on yield, income and other parameters and farmers ranked zero tillage technology of wheat cultivation as the best among all the interventions. The reason could be more yield (Mehla et al 2000, Singh et al 2006 and Kumar et al 2006), reduction in per unit cost of cultivation (Gentil 1995, Sharma et al 2005, Kumar et al 2006 and Singh et al 2006), less depreciation of machinery (Mehla et al 2000, Singh et al 2006), less *Phalaris minor* infestation (Samar et al 2002, Singh et al 2006 and Kumar et al 2006) and less environmental pollution due to less CO₂ emission (Gentil 1995, Derpsch 1998). Improved varieties of wheat, improved varieties of paddy, use of balanced nutrients, weed control and control of insect, pest and diseases were ranked II, III, IV, V and VI, respectively (Table 6). It could be interpreted from the above findings, that relative advantage in terms of yield was the most important criteria for adoption of new technologies.

Table: 6. Adoption of crop production interventions under TAR-IVLP in Irrigated Agro eco-system

Technologies	Ranks
Improved wheat varieties	II
Improved paddy varieties	III
Zero Tillage Technology	I
Use of balanced nutrients	IV
Weed control	V
Control of insect, pest and diseases	VI

b. Matrix Ranking for Adoption of Fodder Production Interventions

Among the IVLP interventions on fodder cultivation, improved varieties of berseem was ranked first (Table 7) because of more yield, more number of cuttings, better quality, availability of green fodder for a longer period, etc. Improved varieties of sorghum, oat and fodder maize were placed at II, III and IV ranks, respectively.

Table: 7. Adoption of improved fodder crop varieties in irrigated agro eco-system

Reasons	Rank			
	Berseem	Oat	Fodder Maize	Sorghum
More productivity	I	IV	III	II
More number of cuttings	I	II	III	IV
Better fodder quality	I	II	IV	III
Supply of fodder for a longer time	I	III	IV	II
Early maturity	III	IV	I	II
Cultivation during lean period	I	IV	III	II
Overall	I	III	IV	II

c. Matrix Ranking for Adoption of Interventions related to Dairying

In dairying, several technological interventions related to feeding, breeding and healthcare were assessed and ranked. Among the feeding technologies, complete feeding performed better over mineral and vitamin supplementation and bypass protein technology (Table 8).

Table: 8. Adoption of improved feeding technologies in irrigated agro eco-system

Reasons	Rank		
	Mineral and Vitamin Supplementation	Complete Feeding	Bypass protein technology
More yield	III	I	II
More income	III	I	II
Better growth	I	II	III
Good health	I	II	III
Overall	II	I	III

Breeding related technologies viz., artificial insemination and induced lactation were ranked first and second, respectively (Table 9). Vaccination was the best healthcare technology and preferred because it has direct bearing on health, growth and mortality of dairy animals.

Table: 9. Adoption of improved breeding technologies in irrigated agro eco-system

Reasons	Rank	
	Artificial Insemination	Induced Lactation Technology
Superior progeny	I	II
Overcomes reproductive disorders	-	I
Cost of the technology	II	I
Rate of success	I	II
Overall	I	II

The other technologies i.e. mineral and vitamin supplementation have been very successful and had a positive impact on the growth of young calves in the study area (Table 10).

Table: 10. Adoption of improved healthcare technologies in irrigated agro eco-system

Reasons	Rank	
	Mineral and Vitamin Supplementation	Vaccination Superior progeny
Better growth	I	II
Good health	II	I
Less mortality	II	I
Overall	II	I

But the overall observation of the farmers about these feeding, breeding and healthcare technologies was that most of these technologies were difficult to adopt, as they require expert handling.

All the technologies related to dairying were ranked and it was found that AI was the most preferred followed by vaccination, deworming and complete feeding (Table 11).

Table: 11. Overall Adoption of technologies related to dairying in irrigated agro eco-system

Technologies	Rank
Mineral and Vitamin Supplementation	IV
Complete Feeding	III
Bypass protein technology	VI
Artificial Insemination	I
Induced Lactation Technology	V
Vaccination and deworming	II

d. Matrix Ranking for Discontinuance

In this matrix ranking, farmers first adopted the technologies but discontinued due to certain reasons. In the study area, there were a few interventions discontinued by the farmers.

Matrix Ranking for Discontinuance of Crop Production Interventions

Superfine varieties of basmati rice Pusa Sugandh-I and Pusa Sugandh-2 developed at IARI, New Delhi were assessed in the IVLP villages and both the varieties were discontinued because of low yield, poor quality of grain and low market price (Table 12).

Table: 12. Discontinuance of improved basmati paddy variety in irrigated agro eco-system

Reasons	Rank	
	Pusa Sugandh 1	Pusa Sugandh 2I
Low yield	I	II
Poor grain quality	I	II
Less market price	I	II
Incidence of insect-pest and diseases	I	II
Overall	I	II

HD 2687 variety of wheat and zero tillage technology were also discontinued by some of the farmers due to non-availability of seed of HD 2687 and zero tillage machines. Some of the farmers found that growing of

HD 2687 could not give better yield over PBW 343. Under zero tillage technology too, only a few farmers discontinued the technology as there was no yield gain (Table 13).

Table: 13. Discontinuance of technological intervention on wheat in irrigated agro eco-system

Reasons	Rank	
	HYV of wheat (HD 2687)	Zero Tillage Technology
Non availability (seed/machine)	II	I
High cost	II	I
No relative yield gain	I	II
Overall	II	I

Matrix Ranking for Discontinuance of Feeding Technology

Urea treatment of straw was discontinued because it is tedious, labour intensive, there is storage problem, poor taste and the most important, the availability of green fodder in irrigated agro eco-system (Table 14).

Table: 14. Discontinuance of urea treatment of straw in irrigated agro eco-system

Reasons	Rank
Labour consuming	II
Tedious	I
Availability of green fodder	III
Storage problem	IV
Poor taste	V

2. Rainfed Agro Eco-system

a. Matrix Ranking for Adoption of Crop Production Interventions

In rainfed agro eco-system improved varieties of crops were assessed by the farmers through matrix ranking. It was found that improved mustard varieties were ranked first in terms of more yield and income (Table 15).

Table: 15. Adoption of improved varieties of major crops in rainfed agro eco-system

Reasons	Rank						
	Wheat	Gram	Mustard	Groundnut	Soybean	Sorghum	Barley
More yield	I	III	VI	IV	V	VII	II
More income	I	III	V	II	IV	VII	VI
Requires less time for maturity	VII	III	I	IV	II	VI	V
Labor saving	V	I	II	VI	VII	IV	III
Less water requirement	VII	I	III	V	IV	VI	II
Low incidence of insect pest and diseases	II	IV	VI	V	III	VII	I
Less weed infestation	IV	II	I	V	VI	VII	III
Overall	IV	III	I	VII	V	VI	II

Improved varieties of barley, gram, wheat, soybean, sorghum and groundnut were ranked II, III, IV, V, VI and VII, respectively. Crops that require less water such as mustard, barley, gram were ranked high. From the above ranking it is evident that farmers preferred those crops, which required less water. Most of the varieties were preferred because of better yield, more income, shorter duration and less water requirement.

b. Matrix Ranking for Adoption of Fodder Production Interventions

Improved fodder varieties were assessed in rainfed agro eco-system and improved variety of berseem was ranked first followed by fodder maize, sorghum and hybrid Napier (Table 16).

Table: 16. Adoption of improved fodder varieties in rainfed agro eco–system

Reasons	Rank			
	Berseem	Sorghum	Hybrid Napier	Fodder maize
More productivity	I	IV	III	II
More number of cuttings	I	II	III	IV
Better quality of fodder	I	II	IV	III
Supply of fodder for a longer time	II	III	I	IV
Early maturity	I	III	IV	II
Cultivation during lean period	II	III	I	IV
Overall	I	III	IV	II

c. Matrix Ranking for Adoption of Interventions related to Dairying

Matrix ranking exercise on feeding interventions revealed that concentrate feeding was the most preferred one (Table 17). Farmers ranked complete feeding, mineral mixture supplementation and enriched roughage at II, III and IV, respectively. Among the healthcare interventions vaccination against FMD, BQ and HS was ranked first followed by deworming and parasite control (Table 18).

Table: 17. Adoption of feeding technology in rainfed agro eco–system

Reasons	Rank			
	Mineral Mixture Supplementation	Complete feeding	Concentrate	Enrichment of low grade roughage
More yield	III	II	I	IV
More income	III	II	I	IV
Better growth	III	I	II	IV
Overall	III	II	I	IV

Table: 18. Adoption of healthcare technology in rainfed agro eco–system

Reasons	Rank	
	Vaccination against FMD, BQ, & HS	Parasite Control
Good health	I	I
Better growth	I	II
Less mortality	I	II
Less chances of diseases	I	II
Overall	I	II

Overall it could be inferred that among all the interventions on dairying, vaccination was most preferred followed by feeding of concentrate, complete feeding, deworming and parasite control, mineral and vitamin supplementation, and enriched low grade roughage (Table 19).

Table: 19. Overall Adoption of dairy interventions in rainfed agro eco–system

Technologies	Rank
Mineral and vitamin supplementation	V
Complete feeding	III
Feeding of concentrate	II
Enrichment of low grade roughage	VI
Parasite (Ecto & Endo) control	IV
Vaccination	I

d. Matrix Ranking for Discontinuance of Crop Production Interventions

ICJS, an improved variety of groundnut was discontinued due to its poor taste, poor marketability and quality (Table 20). Improved varieties of wheat viz. WH 273 and HD 2189 were discontinued after one year of adoption because they require more water, have grain shattering at the time of harvesting and due to non-suitability for *chapati* making (Table 21). Hence, it is evident from the findings that the farmers preferred those varieties, which required less water as it is available in very limited quantity. It was also observed that farmers preferred wheat varieties good for *chapati* making for home consumption.

Table: 20. Discontinuance of ICJS variety of groundnut in rain fed agro eco-system

Reasons	Rank
Poor taste	I
Less market value	II
Poor grain quality	III

Table: 21. Discontinuance of HYVs of wheat in rain fed agro eco-system

Reasons	Rank	
	WH 273	HD 2189
Requires more water	I	II
Shattering of grains	II	I
Not suitable for chapati making	II	I
Overall	II	I

e. Matrix Ranking for Discontinuance of Fodder Production Interventions

Among the dairy interventions, urea treatment of straw and silage making were discontinued because they are labour consuming, tedious, there is lack of knowledge about the procedure and due to grazing habit of animals (Table 22).

Table: 22. Discontinuance of HYVs of wheat in rain fed agro eco-system

Reasons	Rank	
	Urea treatment of straw	Silage Making
Labour consuming	II	I
Tedious	II	I
Poor taste	I	II
Availability of green fodder	I	II
Storage problem	I	II
Grazing of animals	I	II
Lack of technical knowledge	II	I
Overall	I	II

Conclusion

Matrix ranking of the technological interventions clearly reflected the criteria followed by the farmers for the adoption, rejection or discontinuance of a particular technology under their real farm situations. Yield was one of the most important parameters for the adoption of a new technology. PR 116 of paddy and PBW 343 variety of wheat were most preferred in irrigated agro eco-system. Farmers have discontinued varieties like Pusa Sugandh 1, Pusa Sugandh 2 of basmati paddy and HD 2687, WH 273 and HD 2189 of wheat. Under rainfed agro ecosystem, except ICJS variety of groundnut, all the varieties were preferred. Better yield and more income per hectare were the main parameters for selecting a variety in both the systems. Hence, matrix ranking is an important tool to revalidate and refine the transferred technologies.

References

- Anonymous, 2004. *DARE Report 2003-04*. Krishi Anusandhan Bhawan, New Delhi.
- Derpsch, R.1998. Historical Review of No Tillage Cultivation of Crops. JIRCAS Working Report No. 13. p.1-18.
- Dwivedi, R.N., Singh, M., Sharma, P., Pandey, S., Meena, B.S., Tamankar, M.B., Sharma, R.K. and Upadhyay, J.P., 2004. Nutritive cereal based rainfed agro-ecosystem for Bundelkhand region : TAR through IVLP, IGFR, Jhansi, UP, 2.
- Gentil, LV (1995) Aspectos Economicos do Plantio Directo. In: I Seminario Internacional do Sistema Plantio Directo. Resumos. EMBRAPA-CNPT, Ponta Grossa, RS. Agosto. p.9-12.
- Mehla RS, JK Verma, RK Gupta and PR Hobbs. 2000. Stagnation in the productivity of wheat in the Indo Gangetic plains: zero till seed cum fertilizer drill as an integrated solution. Rice Wheat Consortium Paper Series 8.
- Singh Samar, A Yadav, RK Malik and H Singh.2002. Long term effect of zero tillage sowing technique on weed flora and productivity of wheat in rice wheat

cropping zones of Indo Gangetic plains. In proceedings of International Workshop "Herbicide Resistance Management and Zero Tillage in Rice-Wheat Cropping System" held at CCS HAU, Hisar

Kumar Anuj, Ramchand, Fulzele, R. M., Singh, R. (2006). Impact of zero tillage technology intervention under IVLP on wheat cultivation. Indian Journal of Extension Science. Vol. 1. No. 1 p 19-22.

Singh, R. Kumar Anuj, Kumar, S., Ramesh Chand and Singh, S. (2006) Participatory Research on effect of tillage options on wheat productivity. Indian Journal of Extension Science. Vol. 1, No. 1 p 106-109.

Sharma R.K., S.C. Tripathi, A.S. Kharub, R.S. Chhokar, A.D. Mongia, Jag Shoran, D.S. Chauhan and S. Nagarajan.(2005) A decade of research on zero tillage and crop establishment. Research Bulletin No. 18, DWR, Karnal, India.