

ANALYZING THE GAP BETWEEN RECOMMENDED AND ADOPTED PRACTICES OF POTATO PRODUCTION TECHNOLOGY IN DISTRICT OKARA, PUNJAB

Muhammad Shakeel Latif, Nowshad Khan & Farhat Ullah Khan

Department of Agricultural Sciences, Allama Iqbal Open University, Islamabad

ABSTRACT

Potato is an important vegetable crop. It is grown under cooled season with sandy to clay loamy fertile soil. Potato is the rich source of Potassium and Vitamin C. Agriculture extension sources (public and private) actively participate for imparting awareness to farmers about recommended practices for potato production and provide guideline for adopting these practices. The main focus of this study was to analyze the gap between recommended and adopted practices of potato production technology. Okara is the main hub of Potato in Pakistan. From 3 tehsils (Okara, Depalpur, Renala Khurd) of district Okara, tehsil okara was selected randomly. The study had been designed by collecting primary data through field survey, using random sample of 120 potato growers from Okara. Frequencies and Percentages were used as statistical tool through SPSS 20.0.0. The study showed that mostly farmers were aware of recommended production technology of potato and many of them adopted too. But a large number did not used recommended practices. So there is the need to enhance the efforts of extension services and introduce more advanced recommendations for achieving high per acre yield of potato. Extension efforts must be according to need of farmers.

Keywords: *Potato, Production Technology, Awareness, Adoption, Practices*

INTRODUCTION

Potato (*Solanum tuberosum* L.) is one of the most indispensable vegetable crops all over the world as well as Pakistan. It is a basic part of the universal diet system and world's top ranked non-grain food stuff. It is one of the leading vegetable crop and 6th most usable crop in the world (FAO, 2009). Potato has good value and blessed with completely free of fat, cholesterol and sodium. (United State Potato Board, 2012). One potato (100 g) provides 70 K Cal energy to human body, 455 mg of Potassium and 15.9 g of carbohydrates and 1.9 g of protein. It is considered as one of the richest source of starch, minerals and vitamins particularly Vitamin C. 100g of potato provides 11.4g Vitamin C which provides resistance against infectious and harmful agents in our body (Potato Nutrition Facts, 2012). Potato crop is cultivating in winter season when temperature ranges from 18C° to 25C°. With increasing temperature, tuber production becomes low. Its growth gives best production on fertile, deep sandy to clay loamy soil with good water holding capacity (Malik, 2009).

In Pakistan, potato is one of the large crop with respect to quantity. It is a major cash crop of district Okara which is the largest potato producing district in Punjab as well as Pakistan and its importance cannot be ignored. Being the major producer and main market of potato, Okara is also known as the capital of potato in Pakistan. Seventy to 75% of total potato is produced in the season of autumn (Sep-Oct to Jan-Feb), 15 to 20% during summer (Mar-May to Aug-Oct) and 7-10% during spring season (Jan-Feb to April-May) in Okara. (SMEDA, 2010). As Okara is the main potato production area so it is useful to carry out a study to know the gap between recommended and adopted practices of potato production technology; land preparation for potato, sowing time, seed selection, sowing methods, irrigation practices, practices regarding fertilizer application, plant protection measures, harvesting and storage practices for potato.

Public as well as private sector (pesticide, seed & fertilizer companies) provide information related to recommended potato production practices to farmers. Extension Field Staff exercise variety of extension teaching means to communicate potato producing technology to potato growers. Private sector considered as a big source of extension services to farmers because different local and multination companies have their own field force to sale their product as well as for delivering extension services to farmers (Shafique, 2008).

LITERATURE REVIEW

Farmers` awareness and adoption of recommended production practices are very necessary for achieving desirable per acre yield. So main purpose of extension field staff (public as well as private) is to disseminate useful advices regarding farming and recommended production practices for various crops according to area and environment. Most of the potato farmers (61.0-83.3%) were aware about Desiri, Diamint and Santey (potato varieties) respectively in Depalpur. Whereas farmers adopted all varieties with low extent except for Santey which was adopted by 75.3% respondents (Butt, Sahi, Choudhary and Muhammad, 2008). Potato growers adopted potato cultivation practices relatively on an average extent. The result showed that accruable farm income; potato output and land holding was positively related to adoption of technologies by farmers (Ekwe and Onunka, 2006).

Among agricultural extension actions carried out by field staff under decentralized extension system, crop cultivation practices were scattered in extremely good and ranked higher. To some extent different trend was found in crop protection activities as they were circulated in very good way and ranked '2'. On the other hand, the information about marketing and post harvest practices were ranked lower (Lodhi, Luqman and Khan, 2006). The farmers consisted low to high level of awareness regarding cotton production practice while in some other cases like plant protection measures and total number of plants per

acre the awareness level was medium to high (Iftikhar, Ali and Ahmad, 2012). Potato growers in Ecuador used chemical to manage pests and enhance yields. Integrated pest management techniques were adopted by farmer due to use of field days and pamphlets. Farmer field schools (FFS) were efficient but costly. There was significant diffusion from FFS to non-FFS farmers, representing high complimentary extension methods (Mauceri, Alwang, Norton and Barrera, 2007).

Disease and pest management were difficult and expensive for organic potato farmers than for conventional. Consumers' attitudes and keenness to pay for organic potatoes require to be considered in a grower's alternative of production technologies. They also concluded that, in the context of socio-demographics attributes, consumers with high education and having children in the household used to eat organic potatoes more often than consumers with low education and having no children (Yue, Grebitus, Bruhan and Jensen, 2008). Extension staff provided the information regarding mango production technologies. As results famers agreed that they possessed knowledge about recommended practices of fertilizer application, plant protection measures, irrigation practices and high and recommended varieties. They also agreed that extension services as far as above agronomic practices were more effective (Tahir, Ahmad and Iftikhar, 2012).

Many studies portrayed the awareness and adoption of different agronomic practices by farmers for producing agriculture produce. Cultivating maize in line was practiced by 63 % farmers while 55 % cultivated cassava in line. 40 farmers applied fertilizer on maize crop. 53 % farmers adopted improved seed of maize and 38 % adopted improved seed of cassava. 26 % maize growers adopted different field treatments while in case of cassava it was 22 %. 66 % and 60 % farmers harvested maize and cassava on time (Johannes, Vabi and Malaa, 2010). The farmers had extremely low knowledge regarding recommended production technology of date palm. Majority of farmers did not possess awareness about date palm varieties, fertilizer application, harmful insects, pests, diseases, sucker transplanting. So they did not apply these production recommendations while relatively large number of farmers knew the irrigation techniques (Ata, Shahbaz, Ahmad and Khan, 2012).

Objectives of Study

- To know the potato varieties adopted by farmers in the study area.
- To identify the gap between recommended and adopted practices of potato production technology; seed selection/land preparation to plant protection measures/harvesting for potato.
- To discover the recommended storage practices of potato applied by farmers.

MATERIAL AND METHODS

In the present research, District Okara was selected being the core region for potato production. District Okara has 3 tehsils; Depalpur, Okara and Renala Khurd. Out of total three tehsils one tehsil Okara was selected randomly. There are 28 rural union councils in tehsil Okara. Out of these 28 rural union councils, six were selected randomly. From each selected union council one village was selected randomly. Twenty potato growers were again randomly selected from each of the selected village. The total sample size was 120 potato growers. Reliable and validated questionnaire was prepared for the data collection from selected respondents. Before data collection, questionnaire was pre tested on 10 regular potato farmers for getting the validity of questionnaire. Descriptive statistics, including frequencies and percentages were employed through SPSS 20.0.0.

RESULT AND DISCUSSION

Table 1. Distribution of respondents according to their awareness of potato varieties

White Potato Seed Varieties	Awareness				Adoption			
	Yes		No		Yes		No	
	F	%	F	%	F	%	F	%
Diamant	120	100	-	-	29	24.2	91	75.8
Sante	120	100	-	-	81	67.5	39	32.5
Faisalabad Safed	111	92.5	9	7.5	13	10.8	107	89.2
Revira	84	70.0	36	30.0	5	4.2	115	95.8
Carrera	77	64.2	43	35.8	6	5.0	114	95.0
Other white varieties	120	100	-	-	7	5.8	113	94.2
Red Potato Seed Varieties	F	%	F	%	F	%	F	%
Desiree	110	91.7	10	8.3	15	12.5	105	87.5
Cardinal	87	72.5	33	27.5	19	15.8	101	84.2
Kuroda	96	80.0	24	20.0	10	8.3	110	91.7
Altamas	106	88.3	14	11.7	8	6.7	112	93.3
Asterix	103	85.8	17	14.2	9	7.5	111	92.5
Bartina	105	87.5	15	12.5	7	5.8	113	94.2
Other red varieties	120	100	-	-	5	4.2	115	95.8

Table 1. illustrates the first objective of the paper which is to get knowledge about farmers` awareness and adoption of potato varieties. According to table 1, all respondents 100% knew about diamant, sante and some other white potato varieties. While 92.5%, 70% and 64.2% respondents were aware about Faisalabad safed, revira, and carrera. Majority (67.5%) of the respondents adopted sante. 91.7%, 88.3%, 87.5%, 85.8%, 80% and 72.5% of respondents knew about Desiree, Altamas, Bartina, Asterix, Kuroda and Cardinal respectively. All respondents were aware but adoption rate was 15.8% and 12.5% in case of red varieties like Cardinal & Desiree respectively. The results are in line with (Butt et

al. 2006) in which they reported that all respondents were aware about sante and majority also adopted. They also reported their findings regarding desiree, cardinal, diamant, Kuroda as well.

Table 2. Distribution of respondents according to their awareness and adoption regarding recommended sowing time of potato

Sowing time	Awareness				Adoption			
	Yes		No		Yes		No	
	F	%	F	%	F	%	F	%
Autumn crop (01Oct-20 Oct)	109	90.8	11	9.2	94	78.3	26	21.7
Spring crop (for seed) 01 Jan-mid Feb	105	87.5	15	12.5	77	64.2	43	35.8

Table 2 illustrates that most of the respondents (90.8% and 87.5%) knew about the sowing time of autumn crop (01oct-20 oct) and spring crop (01 jan-mid feb) of potato respectively. Majority 78.3% of respondents usually practiced to sow potato in autumn season. Adoption level was low as compared to awareness level due to late harvesting of summer/kharif crop or land was not available for potato cultivation.

Table 2 to 11 explains the respondents` behavior towards awareness and adoption of potato production techniques.

Table 3. Distribution of respondents according to their awareness and adoption of recommended practices for land preparation.

Land preparation	Awareness				Adoption			
	Yes		No		Yes		No	
	F	%	F	%	F	%	F	%
Rotavator (one time)	114	95.0	6	5.0	111	92.5	9	7.5
Cultivator (3-4 times)	105	87.5	15	12.5	101	84.2	19	15.8
Planking (3-4 times)	107	89.2	13	10.8	101	84.2	19	15.8

Table 3 describes that approximately all respondents were aware about land preparation practices and majority 92.5% respondents adopted rotavator (one time) properly.

Table 4. Distribution of respondents according to their awareness and adoption of recommended practices for selection of potato seed

Selection of seed	Awareness				Adoption			
	Yes		No		Yes		No	
	F	%	F	%	F	%	F	%
Seed weight (45-60g/seed)	95	79.2	25	20.8	87	72.5	33	27.5
Seed eyes (2-3 eyes /seed)	116	96.7	4	3.3	112	93.3	8	6.7
Recommended seed rate (1200-1500kg/acre)	105	87.5	15	12.5	103	85.8	17	14.2

Large number of farmers (96.7%) knew that 2-3 eyes on one potato seed gave good result in yield but 93.3% took care of 2-3 eyes /seed during selection of seed. Majority of respondents 79.2% were aware of recommended seed weight (45-60g/seed) but 72.5% took care of recommended seed weight (45-60g/seed) during selection of seed. Majority of the respondents 87.5% were aware about recommended seed rate and almost same number were adopted this seed rate (Table 4).

Table 5. Distribution of respondents according to their awareness and adoption of recommended sowing method for growing potato

Sowing method	Awareness				Adoption			
	Yes		No		Yes		No	
	F	%	F	%	F	%	F	%
Stored potatoes kept shed 10-12days	95	79.2	25	20.8	94	78.3	26	21.7
Automatic Potato Planter	120	100	-	-	59	49.2	61	50.8
Bed to bed distance (75cm=24"-30")	104	86.7	16	13.3	103	85.8	17	14.2
Plant to plant distance (18-20cm=7.2"- 8")	101	84.2	19	15.8	96	80.0	24	20.0
Depth of seed (7-10cm=2.8"- 4")	110	91.7	10	8.3	109	90.8	11	9.2

Table 5. shows that 100%, 91.7%, 86.7%, and 84.2% of respondents were aware of different recommended practices related to sowing methods like automatic potato planter, recommended depth of seed, recommended bed to bed distance and recommended plant to plant distance respectively, except the first one (Stored potatoes kept under shed for 10-12 days) which was known by 79.2% of respondents. The adoption rate among respondents about recommended practices of sowing were in this pattern; Depth of seed 90.8%, Bed to bed distance 85.8%, Ridger with tractor 82.5%, Plant to plant distance 80.0%. The results are conform in some extent with (Ata et al. 2012) in which almost 1/3rd of respondents had awareness of recommended sowing methods like bed to bed, plant to plant distance.

Table 6. Distribution of respondents according to their awareness and adoption of recommended irrigation practices for growing potato

Irrigation	Awareness				Adoption			
	Yes		No		Yes		No	
	F	%	F	%	F	%	F	%
1 st irrigation after sowing with care	120	100	-	-	120	100	-	-
Light irrigation at 7-10 days interval	104	86.7	16	13.3	68	56.7	52	43.3
Max. 10 times	68	56.7	52	43.3	52	43.3	68	56.7
Not applied upon beds	104	86.7	16	13.3	104	86.7	16	13.3
Irrigation 10-15days before maturity	113	94.2	7	5.8	113	94.2	7	5.8

Table 6. gives the information that majority of the respondents 100%, 94.2%, 86.7%, and 86.7% were aware of the most of the recommended irrigation practices like 1st irrigation

after sowing with care, irrigation stopped 10-15days before maturity, Light irrigation at 7-10 days interval and water not applied upon beds respectively except the practice of maximum 10 times application of irrigation to field which is known by just 56.7% respondents. Majority 100%, 94.2%, 86.7% of the respondents adopted the recommended practices of irrigation like 1st irrigation after sowing with care; Irrigation stopped 10-15days before maturity; water not applied upon beds respectively. While 56.7% and 43.3% respondents adopted the irrigation practices like Light irrigation at 7-10 days intervals and Maximum 10 times of irrigation.

Table 7. Distribution of respondents according to their awareness and adoption of recommended fertilizer amount for potato production

Fertilizer	Awareness				Adoption			
	Yes		No		Yes		No	
	F	%	F	%	F	%	F	%
Green manuring	120	100	-	-	23	19.2	97	80.8
Farm Yard Manure (25-30t/acre)	6	5.0	114	95.0	1	0.8	119	99.2
Nitrogen (100-125kg/acre)	116	96.7	4	3.3	103	85.8	17	14.2
Phosphorous (80-90kg/acre)	117	97.5	3	2.5	104	86.7	16	13.3
Potash (50kg/acre)	118	98.3	2	1.7	98	81.7	22	18.3
Zinc sulphate 21% (10 kg/acre)	110	91.7	10	8.3	93	77.5	27	22.5
Boron (3kg/acre)	101	84.2	19	15.8	71	59.2	49	40.8

Table 7. illustrates that most of the fertilizer practices like Green manuring, recommended amounts of potash, phosphorous, nitrogen, zinc sulphate and boron were known by bulk of the respondents 100%, 98.3%, 97.5%, 96.7%, 91.7%, and 84.2% respectively. However, only 5% were aware about recommended amounts of Farm Yard Manure. The adoption rates of recommended doses of nitrogen and Phosphorous among respondents were 85.8% and 86.7%. Almost 81.7%, 77.5%, 59.2%, and 19.2% of respondents were aware about recommended doses of Potash, Zinc sulphate, Boron, and Green manuring respectively. While only 0.8% respondent used recommended doses of Farm Yard Manure (FYM).

Table 8. Respondents about awareness and adoption of recommended fertilizer application

Mode of Fertilizer application	Awareness				Adoption			
	Yes		No		Yes		No	
	F	%	F	%	F	%	F	%
Full dose of K ₂ O+full dose of P ₂ O ₅ +full dose of zinc+1/2 N at the time of sowing	84	70.0	36	30.0	76	63.3	44	36.7
Remaining nitrogen after one month with irrigation	107	89.2	13	10.8	105	87.5	15	12.5

Table 8 exemplifies that 89.2% of respondents were aware of 2nd mode of fertilizer application mentioned in above table and 87.5% of respondents adopted it. 1st mode of application was known by 70% of respondents and adopted by 63.3%.

Table 9. Distribution of respondents according to their awareness and adoption of recommended control measures against weeds/insect pest/diseases.

Mechanical control measures against weeds	Awareness				Adoption			
	Yes		No		Yes		No	
	F	%	F	%	F	%	F	%
Hand pulling of weeds	120	100.0	-	-	18	15.0	102	85.0
Hoeing	118	98.3	2	1.7	10	8.3	110	91.7
Tillage	118	98.3	2	1.7	24	20.0	96	80.0

Table 9 depicts that all respondents (100%) were aware of chemical control and mechanical control of weeds/insect pest/diseases while only 1.7% of respondents were aware of biological method. A vast majority 95% of respondents adopted chemical control and 45% of respondents adopted mechanical control. No one adopted biological measures for weeds/insect pest/diseases control.

Table 10. Distribution of respondents according to their awareness and adoption of different mechanical practices against weeds

Control measures against weeds/insect pest/diseases	Awareness				Adoption			
	Yes		No		Yes		No	
	F	%	F	%	F	%	F	%
Biological control	2	1.7	118	98.3	-	-	120	100.0
Mechanical control	120	100	-	-	54	45.0	66	55.0
Chemical control	120	100	-	-	114	95.0	6	5.0

Table 10 shows that each practice of mechanical control for weeds control was known by almost all respondents. 20% of respondents adopted tillage for weeds control. Only 15% and 8.3% of respondents adopted hand pulling of weeds and hoeing for weed control.

Table 11. Distribution about awareness and adoption practices of harvesting potato

Harvesting Recommendation	Awareness				Adoption			
	Yes		No		Yes		No	
	F	%	F	%	F	%	F	%
Last dec. to start jan.	95	79.2	25	20.8	84	70.0	36	30.0
Before harvesting cut leaves of plant	113	94.2	7	5.8	108	90.0	12	10.0
Harvesting at morning (at low temp.)	115	95.8	5	4.2	111	92.5	9	7.5
Potato ditoner/potato digger	96	80.0	24	20.0	65	54.2	55	45.8
Placed under shade (3-4 days) for healing from injuries	50	41.7	70	58.3	48	40.0	72	60.0

Table 11. points out that almost all respondents were aware of these harvesting practices (Harvesting at morning, Before harvesting cut leaves of plant, Last dec. to start jan., Potato ditoner, potato digger) but the adoption rate of these practices were as follows: - almost majority of the respondents 92.5% harvesting at morning, most 90.0% before harvesting cut leaves of plant, 70% last dec. to start jan., 54.2% potato ditoner/ potato digger. A small number of farmers (41 %) were aware of the practice that potato produce should be placed under shade for healing and almost same numbers (40 %) also adopted this practice.

Table 12. Distribution about awareness and adoption of practices of potato storage

Storage Recommendation	Awareness				Adoption			
	Yes		No		Yes		No	
	F	%	F	%	F	%	F	%
Potato must free from soil	118	98.3	2	1.7	114	95.0	6	5.0
Packed in gunny bags	120	100	-	-	120	100	-	-
Cut and injured potatoes must not be stored	120	100	-	-	120	100	-	-
Use rice husk	120	100	-	-	120	100	-	-

Table 12 describes the last objective of the study which is to acquire knowledge of farmers regarding their awareness and adoption of recommended potato storage practices. All respondents knew and adopted following storage practices:-Potato must be packed in gunny bags, Cut and injured potatoes must not be stored, Use rice husk. Almost all respondents were aware of the storage practice (Potato must free from soil) and 95% farmers adopted this practice.

CONCLUSION

According to the reflection of research study, most of the potato seed varieties were not adopted by farmers despite of having awareness. The reason behind this was of high prices. Govt should take positive steps to stable and minimize seed prices. Majority of farmers are aware about recommended potato production practices and many of them also adopt these recommended practices for potato production in study area. It means that extension worker (public or private) perform their duty but not perfectly. Because many farmers did not apply recommended practices of potato production technology. So there is the need to accelerate the efforts of providing extension services and extension worker (public or private) should apply proper extension method according to the situation and audience (farmers) and also introduced more advanced recommendations/technologies for increasing per acre yield of potato.

Government should also encourage farmers for organic farming by the help of extension field staff because very low number of potato farmers use farm yard manure and green

manure in their fields. Farming must be more mechanized. So, government should subsidize farm machinery like potato planter and potato digger as the adoption rate of such machinery was low. Unavailability of irrigation water was also the serious problem. Govt. should take steps for availability of irrigation water particularly in winter crops like potato and also subsidize electricity cost for tube wells. As many of farmers complained of deficiency of water during potato cultivation. This deficiency discouraged farmers for adopting recommended irrigation techniques in this study. As far as recommended practices of storage of potato, mostly farmers adopted recommended practices for potato storage. Farmers also stored their produce in field in the forms of heaps and in cold storage too. Government should monitor the cold storage. Government should also take steps for stabilizing the potato prices as uncertain fluctuation discourages potato growers for non adoption of recommended production practices.

References

- Ata, S., Shahbaz, B., & Ahmad, M. (2012). Factors hampering date palm production in the Punjab: A case study of DG Khan District. *Pakistan Journal of Agricultural Sciences*, 49(2), 217-220.
- Butt, T. M., Sahi, S. T., Choudhary, K. M., & Muhammad, S. (2008). Role of mass media for enhancing potato production in district Okara of Pakistan. *Indian Research Journal Extension Education*, 8 (1):16-18.
- Ekwe, K. C., & Onuka, B. N. (2006). Adoption of sweet potato production technologies in Abia state, Nigeria. *Journal of Agriculture and Social Research*, 6 (2): 312-325.
- Food and Agriculture Organization. Food and Agricultural commodities production. Retrieved on Jan 05, 2012 from: http://faostat3.fao.org/faostat-gateway/go/to/browse/rankings/commodities_by_regions/E.
- Iftikhar, M., Ali, T., & Ahmad, M. (2012). Factor affecting cotton quality: Study accentuate training needs of cotton growers of district Bahawalnagar, Punjab, Pakistan. *Pakistan Journal of Agricultural Sciences*. 49(4), 561-564.
- Johannes, T. A., Vabi, M. B., & Mala, D. K. (2010). Adoption of maize and cassava production technologies in the forest –savannah zone of Cameroon: Implication for poverty Reduction. *World Applied Sciences Journal*. 11 (2): 196-209.
- Lodhi, T. E., Luqman, M., & Khan, G. A. (2006). Perceived effectiveness of public sector extension under decentralized agricultural extension system in the Punjab, Pakistan. *Journal of Agriculture & Social Sciences*. 2(3),195–200.
- Mauceri, M., Alwang, J., Norton, G., & Barrera, V. (2007). Effectiveness of integrated pest management dissemination techniques: A case study of potato farmers in Carchi, Ecuador. *Journal of Agricultural and Applied Economics*, 39(03), 765-780.

Malik, M. N. (2009). Vegetable Crops: Tuber Crops, Potato (1st Ed.). National Book Foundation, Islamabad. Nutritional Value. The United State Potato Board. Retrieved on Jan 04, 2012 from: <http://www.potatogoodness.com/nutrition/nutritional-facts/>.

Potato Nutrition Facts, Retrieved on Jan 04, 2012 from: <http://www.nutrition-and-you.com/potato.html>.

Shafique, M. S. (2008). Potential options for effective agricultural extension in Pakistan. Retrieved on Jan 01, 2012 from: <http://www.internationalhydropolitics.com/node/2>.

SMEDA. (2010). Potato Cluster Profile Okara. Retrieved on Jan 06, 2012 from: http://www.smeda.org/downloads/potato_cluster_profile_okara.pdf

Tahir, W. A., Ahmad, M., & Iftikhar, M. (2012). An analysis of the effectiveness of extension work conducted by public sector with special reference to mango in the southern Punjab, Pakistan. *Pakistan Journal of Agricultural Sciences*. 49(2), 229-232.

Yue, C., Grebitus, C., Bruhan, M. & Jensen, H. H. (2008). Potato Marketing – Factors affecting organic and conventional potato consumption patterns. *12th Congress of the European Association of Agricultural Economists*.