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INSIGHT INTO THE INFORMATION GAP OF CAULIFLOWER GROWERS- EVIDENCE FROM PERI-URBAN AREAS OF FAISALABAD, PAKISTAN

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ABSTRACT

This study was conducted at the Institute of Agriculture Extension and Rural Development, University of Agriculture, Faisalabad, Pakistan during the year 2015. The study assesses information gap of cauliflower growers in peri-urban areas of Faisalabad, Pakistan. Two hundred and eight cauliflower growers were interviewed using a validated and reliable questionnaire. Findings revealed that majority of the growers was middle aged with low educational level and they were growing vegetables mainly for commercial purpose. Vegetable growers were unaware of many production technologies of cauliflower. The main areas of unawareness among vegetable growers were fertilizer application followed by insect/pest/disease management, their identification and appropriate seed rate. It was Recommended that Agriculture Department should develop insects/pest and diseases resistant varieties for farmers. In addition, strong linkages should be developed between all the stakeholders for effective dissemination of technologies among vegetable growers.

KEYWORDS: ***Brassica oleracea*; Information gap; cauliflower; peri-urban areas; vegetables; training needs; Pakistan.**

INTRODUCTION

Vegetables are the important part of our food essential for maintaining human health. For normal metabolic activities, minerals are very essential ingredients of diet whereas vegetables are the excellent source of minerals. Vegetables also contain other valuable ingredients for building up and repairing the body. These are used in different forms such as leaves, stems, fruits, edible roots, etc. In short, we can say that vegetables are “natural caches of nutrients gifted by Almighty Allah to human beings” (16). Being an essential component of human diet, vegetables are consumed all over the world to have a reduced risk of some chronic diseases. Sufficient vegetables

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consumption may reduce the heart diseases to 23 percent (25). The intake of minimum 400 gram of fruits and vegetables per day per man can be helpful to fulfill nutritional requirements for a healthy existence (19). Cauliflower is an important vegetable to meet the dietary needs of large masses through provision of different types of minerals and vitamins especially vitamin C. It has not only a lot of cardiovascular benefits but its consumption also helps to reduce lungs, colon, breast, ovarian and bladder cancer. Due to its resistance against cancer, it is named as anti-cancer vegetable (29).

Because of population pressure, vegetables consumption is increasing but, so far, per capita intake is below the level recommended by World Health Organization (WHO). This situation solemnly points to the need to increase vegetables production (6). In Pakistan, to meet the demands, production of vegetables is not enough which results in high prices (3). There is double increase in the growth of urban population than those of total growth. Asian countries are leading in this regard (8). Due to their perishability, vegetable commodities have received greater attention and in developing world these are produced closer to their consumption area. Vegetable production has thus become concentrated in peri-urban zones in Asia (21). In Pakistan fruit and vegetable markets have been established by the cities and towns to utilize the supply from the nearby areas. Government of Pakistan has thus decided to establish fruit and vegetable zones in big cities like Karachi, Faisalabad, Multan, Swat and Quetta where more than 36 varieties of vegetables are grown (7). In past decades, vegetable production has remained very low in Pakistan because the research institutes and researchers have not given due priority and it has been inadequately addressed. Moreover, the extension organizations are not giving due importance to vegetable production. Realizing the importance of vegetables, allocation of research budgets is under consideration for this neglected food frontier (1). Urban and rural poor will have access to vegetables when the prices will be in the range of people and by increasing productivity we can keep the vegetables prices in limited range (7). Chaudhry *et al.* (13) argued maximum reliance of farmers or friends, neighbors, relatives and mass media for information. Findings further revealed that in mass media more focus appeared to be on TV rather than radio and print media. Extension agents, mass media and progressive/fellow farmers are assumed as effective sources of information. Though, effectiveness of these sources varies under different conditions.

This study is of distinctive nature as peri-urban areas are scanty targeted by researchers. Particularly, vegetables cultivation has not been discussed and

investigated by the researchers of vast fields. Hence, this study will embark in-depth insights of the farmers practicing vegetables cultivation in peri-urban areas. In addition, findings also may fruitful for the strength of Faisalabad Peri-Urban Structure Plan 2035, approved by District Design and Planning Committee with the aim of sustainable development in peri-urban areas. The plan assumes that ample agricultural land is available for main crops such as sugarcane, wheat, cotton, maize, rice and vegetables. Hence, the findings could document the areas of improvement for the success of this plan.

MATERIALS AND METHODS

The study was conducted at the Institute of Agri. Extension and Rural Development, University of Agriculture, Faisalabad, Pakistan during the year 2015. Peri urban areas of Faisalabad were selected for this study. The Faisalabad Bypass which is around the city to let through traffic flow without interference from local traffic and is almost 15-20 kilometer away from the main city, was considered as the end point of peri-urban area. Therefore, the areas falling between Faisalabad city and Bypass were selected. Farmers growing vegetables in peri-urban areas of Faisalabad served as study population.

A complete list of registered vegetables growers (sampling frame) was obtained from the office of F&VDP, Faisalabad. According to the Table developed by Fitz-Gibbon *et al.* (15) for determining the sample size, 208 vegetable growers were selected as study sample through random sampling technique.

Keeping in view the study objectives, a comprehensive interview schedule was prepared and used as research instrument for data collection. It was also be pre-tested to check its validity and reliability.

The data were collected through face to face interviews as this is the most appropriate data collection method for getting information (24). Moreover, qualitative techniques like observations and focused group discussions were also be used for in-depth analysis.

Collected data were analyzed using Statistical Package for Social Sciences (SPSS). Descriptive as well as inferential statistics were applied to make the data meaningful.

In order to determine the existing knowledge, awareness of individual respondent about all recommended production technologies was calculated and divided by the total number of recommended production technologies.

The obtain value was multiplied with 100 to get percentage of existing knowledge. In order to determine the training needs, the existing knowledge of vegetable growers was subtracted from 100 to get the information gap. The data obtained were then divided into five categories i.e. very low (0-20%), low (21-40%), medium (41-60%), high (61-80%) and very high (81-100%).

RESULTS AND DISCUSSION

Age

It is assumed that with the passage of time individual becomes mentally mature and takes rational decisions. Kashif (18) explained that with the increase in age the awareness about production practices also increased. It was also found that with increasing age, knowledge about plant protection also increased. Bashir and Albarbarawi (11) argued that the age of respondents had a strong effect on adoption of technologies by them. Therefore, age can be one of the important factors influencing the adoption behavior of the individual. Keeping in view the importance of age, farmers were inquired about their age and the data in this regard are given in Table 1.

Table 1. Distribution of respondents according to age.

Age (in years)	*f*	Percentage
Young (up to 35)	42	20.2
Middle (>36-50)	109	52.4
Old (above 50)	57	27.4
Total	208	100.0

Data depicted that a simple majority (52.4%)of farmers fell in age category of 36-50 years followed by 27.4 percent farmers who belonged to old age category (above 50 years). Only about one fifth (20.2%) of the respondents belonged to age category of upto 35 years. It may be inferred that young aged farmers might be less interested in farming as compared to middle or old aged farmers.

In Pakistan, 53.24 million population is considered as youth falling in the age of 15-29 which will touch the significant figure of 63.27 million in 2030. These young people are energetic and have the potential to make significant contribution to agricultural development at various levels (9).

The results of the present study are almost similar to those of Latif (20) who reported that 18.75 percent of respondents belonged to young aged category

followed by middle aged (52.75%) and old aged (28.5%). The results of Aftab (4) also partially coincide with those of present study who stated that 15.0 percent of respondents belonged to young aged category followed by middle aged (50.0%) and old aged (35.0%). However, the results of Adil (2) are contradictory to those of the present study who reported that 50 percent of the respondents belonged to young aged category, 23.3 percent belonged to middle aged category and 26.7 percent belonged to old aged category. It might be due to the reason that the study was conducted in different area.

Education

Education is the process for bringing positive change in the behavior of individual. It is obvious that an educated person is always keen and logical towards innovations. It is concluded in many research studies that education plays a vital role in the adoption process of recommended production practices (5, 22). It is extremely vital to get education if one wants to achieve success in life. Education has an enormous impact on the human society. It guides and trains human mind to think and take right decisions. Education is necessary if a nation aims to achieve growth and development (27). Rehman *et al.* (26) reveal that as educational level of farmers increases, the output in terms of changed behaviour also increases. Extension agent's communication also becomes easier and effective with educated person. Keeping these facts in view, the respondents were asked about their educational level. The data regarding educational status of the respondents are presented in Table 2.

Table 2. Distribution of respondents according to education

Years of schooling	*f*	Percent
Illiterate (0)	109	52.4
Upto primary (1-5)	29	13.9
Primary-middle (6-8)	23	11.1
Middle-matriculation (9-10)	20	9.6
Above matriculation (10+)	27	13.0
Total	208	100.0

Data indicate that 52.4 percent of respondents appeared illiterate while a good number 47.6 percent of respondents was literate while Among the literates, most (13.9%) of the respondents had upto primary level of education. Respondents with educational level between primary and middle (6-8) were 11.1 percent. About one-tenth (9.6%) of the respondents were having education between middle and matriculation. Respondents with above matriculation were 13 percent. The results of present study are contradictory to those of Arshad (10) who found that 77.33 and 74.0 percent of the

respondents were literate whereas, 22.67 and 26 percent were found as illiterate. Similarly, previous study (28) showed the similar trend with those of present study with little bit variation.

Purpose of growing vegetables

Data (Table 3) further reveal that farmers were cultivating vegetables for domestic as well as commercial purpose. However, negligible percentage (5.8%) of farmers reported domestic purpose of vegetables cultivation. During informal discussion the farmers opened that healthy life requires nutritious vegetables and it comes from domestic level produce. It also saves the cost as vegetable prices are high in the market. In addition, fresh vegetables grace your dining table at ease. On other hand, 7.2 percent farmers cultivated vegetables for commercial purpose. They explained their motive of earning best return through vegetables marketing for their livelihoods. Vast majority (87%) of farmers adopted vegetable cultivation for both domestic and commercial purposes. They explained that vegetables produce at their farm not only fulfill their dietary needs but also exhibit best return to spend for their sustainable livelihoods.

Table 3. Distribution of respondents according to their purpose of growing Vegetables

Purpose of growing vegetables	F	Percentage
Domestic use	12	5.8
Commercial use	15	7.2
Both	181	87.0
Total	208	100.0

Awareness level of cauliflower growers

Awareness regarding improved and site specific technologies of vegetables cultivation enables growers to obtain enhanced production and better returns. Therefore, awareness holds significant importance in agricultural process and agricultural extension is a vital force rendering information on different aspects. Elizbeth and Zira (14) have documented high level of awareness among vegetables growers through extension activities. Due to this enhanced awareness interest of farmers is increasing in vegetables cultivation (12). Further, considering the significance of awareness, Patil *et al.* (23) recommended urgent need to educate vegetables growers through diversified extension approaches for the achievement of production potential. In this context, respondents were asked to reveal their awareness level regarding production technologies of vegetables. Data in this regard are given in Table 4.

Table 4. Distribution of respondents according to their awareness about recommended production technologies of cauliflower

Recommended technologies	Awareness			
	Yes		No	
Varieties	**F**	**%**	**F**	**%**
Faisalabad No. 1	165	79.3	43	20.7
Faisalabad No. 2	101	48.6	107	51.4
Faisalabad No. 3	78	37.5	130	62.5
Faisalabad No. 4	127	61.1	81	38.9
Land preparation				
2-ploughing+2-planking	173	83.2	35	16.8
Leveling	199	95.7	9	4.3
Nursery raising				
Raised beds (10 cm above ground level)	154	74.0	54	26.0
Seed depth (1cm)	82	39.4	126	60.6
Sowing of seed at evening	191	91.8	17	8.2
Row-row distance (75cm)	94	45.2	114	54.8
Plant-plant distance (20cm)	99	47.6	109	52.4
Seed rate				
½ kg/acre	109	52.4	99	47.6
Sowing season				
May-October	200	96.2	8	3.8
Transplanting				
Season (July-November)	198	95.2	10	4.8
Age of nursery (35-40 days)	179	86.1	29	13.9
Irrigation at the time of transplanting	204	98.1	4	1.9
Time of transplanting (at evening)	191	91.8	17	8.2
Sowing methods				
Ridge sowing	164	78.8	44	21.2
Bed sowing	144	69.2	64	30.8
Fertilizer application				
Application of FYM (15-20 tons/acre) during land preparation	65	31.3	143	68.8
Nitrogen (45 Kg/acre) 1/3 during land preparation, 1/3 before flowering stage, 1/3 after flowering stage	69	33.2	139	66.8
Phosphorous (35 Kg/acre) during land preparation	61	29.3	147	70.7
Potash (25 Kg/acre) 2/3 during land preparation and 1/3 after flowering stage	54	26.0	154	74.0
Irrigation				
Recommended technologies	**Awareness**			
	Yes		**No**	
	F	**%**	**F**	**%**
1st irrigation after transplanting	195	93.8	13	6.3
2nd, 3rd and 4th irrigation after interval of four days	101	48.6	107	51.4
Weekly irrigation when heads begin to form	92	44.2	116	55.8
Diseases				
Rotning of flower	181	87.0	27	13.0
Early blight	120	57.7	88	42.3
Late blight	134	64.4	74	35.6
Insect/pests				

Table Contd……

Army worm	179	86.1	29	13.9
Cabbage butterfly	164	78.8	44	21.2
Diamond back moth	71	34.1	137	65.9
Mustard saw fly	62	29.8	146	70.2
Semilooper	34	16.3	174	83.7
Cabbage borer	101	48.6	107	51.4
Painted bug	43	20.7	165	79.3
Insect/pest management practices Chemical control:				
a. Insecticide				
Emamectin EC-1.9 (200ml/acre)	129	62.0	79	38.0
Indoxacarb EC-150 (175ml/acre)	51	24.5	157	75.5
Cypermethrin EC-10 (250ml/acre)	21	10.1	187	89.9
Carbosulfan EC-500 (20ml/acre)	143	68.8	65	31.3
b. Fungicide				
Mencozeb (2g/kg as seed treatment)	177	85.1	31	14.9
Mencozeb (2.5-3g/L of water and spray after every 10 days)	59	28.4	149	71.6
Cultural control:				
Crop rotation	123	59.1	85	40.9
Insect resistant varieties	99	47.6	109	52.4
Cultivation of soil	75	36.1	133	63.9
Improved drainage	84	40.4	124	59.6
Timely planting	72	34.6	136	65.4
Removal of crop residue	41	19.7	167	80.3
Harvesting				
Medium sized heads (15-20cm)after 60-70 days of sowing	122	58.7	86	41.3
Large sized heads (20-30 cm)after 70-80 days of sowing	125	60.1	83	39.9

Regarding recommended production technologies of cauliflower, the data (Table 4) indicate that Faisalabad No.1 variety appeared most familiar among growers (79.3%) followed by Faisalabad No.4 variety which was known to 61.1 percent respondents and Faisalabad No. 2 variety known to nearly half of the respondents. Awareness of Faisalabad No. 3 was the lowest. An overwhelming majority (83.2%) of respondents was aware of land preparation recommendations. During informal discussion farmers argued that leveling of land not only helps in conserving water but also makes the cultural practices easier which leads towards significant increase in production. Well prepared leveled land also offers enhanced germination of nursery. Regarding nursery raising of vegetables, a vast majority (91.8%) of respondents was familiar with sowing of seed at evening. Similarly a large majority (74%) of respondents also had awareness regarding preparation of beds 10 centimeter above the ground. Farmers stated that raised beds protect plants from excessive water accumulation pertinent to rain and over irrigation. Moreover, they also offer minimum space for weeds germination and make weeds eradication easier. Awareness about other aspects of nursery raising i.e. seed depth, row to row and plant to plant distance was found less than 50 percent. Nearly half (47.6%) of the respondents were unaware of seed rate of

cauliflower. However, almost all the respondents were aware of sowing time. Farmers were of the view that timely sowing always produces higher production than delayed sowing. Transplanting time, sowing season, age of nursery and irrigation were found widely known to respondents.

Fertilizers are essential ingredients for the sustainable soil health. For the long term benefits and use of soil it is compulsory to add adequate amount of fertilizers available in different types. Mainly nitrogen, phosphorus and potassium are used in soil for better crop production. Unfortunately, only about one third of the respondents were aware of recommended dose of fertilizers for cauliflower. Application of irrigation immediately after the fertilizer application is inevitable. An overwhelming majority (93.8%) of the respondents was aware of this practice (Table 4). However, less than half of the farmers were not familiar with the time and schedule of 2nd, 3rd and weekly based irrigation.

Different kinds of insect/pests usually attack cauliflower and reduce production to a greater extent. Iqbal *et al.* (17) reported that vegetables are often susceptible to number of diseases and insect/pests outbreak because of delicate and juicy nature. Rottening of flower, early and late blight were known to relatively less number of respondents. The major insect/pests known to a large majority of respondents were army worm and cabbage butterfly. The insect/pests like diamond back moth, mustard saw fly, semilooper, cabbage borer and painting bug were known to less number of respondents. However, cabbage borer was known to nearly half of the respondents.

Table 5. Information gap regarding production technology of cauliflower

Parameters	Information gap					Rank
	Very low 1-20%	Low 21-40%	Medium 41-60%	High 61-80%	Very High 81-100%	
Fertilizer application				(70.08)		01
Insect/pest/disease management			(56.98)			02
Insect/pest/diseases identification			(47.66)			03
Seed rate			(47.6)			04
Varieties			(43.39)			05
Harvesting		(40.69)				06
Nursery raising		(40.39)				07
Irrigation application		(37.83)				08
Sowing method		(26.00)				09
Land preparation	(10.58)					10
Sowing time	(03.85)					11

It is a well known fact that insect/pests infestation has significant contribution in lowering the production potential, thus awareness of control measures becomes necessary. Awareness about Mencozeb was the highest (85.1%) among the respondents. Crop rotation as a cultural control appeared prominent being known to 59.1 percent of respondents followed by sowing of resistant varieties. Removal of crop residues was the least known cultural practice. Findings imply that more than half of the respondents knew the recommended time of harvesting.

Respondents were asked to highlight information gap regarding production technology of cauliflower and data in this regard are presented in Table 5. Fertilizer application appeared as the most prominent information gap area (70.08%) and was ranked high in all type of selected vegetables. The other areas having medium level of information gap were insect/pest/disease management, insect/pest disease identification, seed rate and selection of varieties. A minimum level of information gap was found for land preparation (10.58%) and sowing time of cauliflower (3.85%) which fell into very low category. Earlier, Elizabeth and Zira (14) concluded that lack of knowledge about improved varieties, seed rate, unavailability of improved seed and lack of integrated pest management (IPM) technologies are the major areas of concern for vegetable growers negatively affecting their vegetable production. The researchers further narrated that by addressing these challenges and narrowing the information gap, potential yield of vegetable crops could be attained which would uplift the livelihoods of vegetable growers.

CONCLUSIONS

Awareness regarding insects/pest and diseases appeared low and during informal discussion non-availability of insect/pest resistant and high yielding varieties was found one of the leading distressing factor. Hence, research scientists should develop insects/pest and diseases resistant varieties for farmers. In addition, research should develop strong linkage with extension department for the familiarity of these varieties among growers. Public sector extension has been working with multiple approaches to make technologies familiar among farmers. Therefore, with reference to vegetables awareness demonstration plots of vegetables could attract more attention of farmers. Like major crops, extension staff must organize demonstration plots of different vegetables for increased awareness among growers.

REFERENCES

1. Abedullah, K. Baksh and B. Ahmad. 2006. Technical efficiency and its determinants in Potato production, evidence from Punjab, Pakistan. The Lahore J. Eco. 11(2):1-22.

2. Adil, R.M. 2008. Training Needs Assessment of Cotton Growers for Quality Cotton Production in Tehsil Rajanpur (unpublished masters thesis). Inst. of Agricultural Extension, University of Agri., Faisalabad-Pakistan.
3. Adil, S.A., A. Maqsood, K. Baksh and S. Hassan. 2012. Forecasting demand and supply of onion in Pakistani Punjab. Pak. J. Agric. Sci., 49(2):205-210.
4. Aftab, R. 2011. Adoption Gap of Weed Management Practices among Potato Growers of Tehsil Chiniot, district Chiniot. (unpublished masters thesis). Inst. of Agricultural Extension, University of Agri., Faisalabad-Pakistan.
5. Amir, R.M. 2009. Barrier Hampering Wheat Production as Perceived by Farmers in Tehsil Burewala, district Vehari. (unpublished masters thesis) Inst. of Agricultural Extension, University of Agri., Faisalabad-Pakistan.
6. Anon. 2004. Fruit and vegetables for health. Report of a joint FAO/WHO workshop, 1-3 september, Kobe, Japan.
7. Anon. 2006. Pre-Feasibility study for Fruit and Vegetable zones in Karachi, Multan, Faisalabad, Swat and Quetta.
8. Anon. 2012. Department of Economic and Social Affairs (DESA). World urbanization prospects, the 2011 revision. Population Division, United Nations, New York.
9. Anon. 2013. Economic Survey of Pakistan, Economic Advisor's Wing, Finance Division, Islamabad. Pakistan.
10. Arshad, A. W. 2009. Adoption of Weed Management Practices among Sugarcane Growers of Tehsil Samundri, District Faisalabad. (unpublished masters thesis) Inst. of Agricultural Extension, University of Agri., Faisalabad.
11. Bashir, M. and J. Albarbarawi. 2011. Factors influencing the adoption of self-services technology. Dept. of Informatics: Master's programme in Human-Computer Interaction; Master degree report.
12. Bhushan, B., A. Jasortia, S. Khajuria, M. Sharma and S. Sethi. 2015. Assessment of adoption pattern of vegetable growers of Doda District (J&K). Adv. Soc. Res., 1(1):1-4.
13. Chaudhry, K.M., S. Muhammad, A. Saghir and I. Ashraf. 2008. Rural women's access to various sources of information in tehsil Faisalabad. J. Anim. Pl. Sci., 18:2-3.
14. Elizabeth, S. and D.Y. Zira. 2009. Awareness and effectiveness of vegetable technology information packages by vegetable farmers in Adamawa State, Nigeria. African J. Agric. Res., 4(2):65-70.

15. Fitz-Gibbon, C. T. and L. L. Morris. 1987. How to Design a Program Evaluation. Newburry Park, CA: Sage Publications.
16. Hanif, R., Z. Iqbal, M. Iqbal, S. Hanif and M. Rasheed. 2006. Use of vegetables as nutritional food: Role in human health. J. Agric. Biol. Sci., 1(1):18-22.
17. Iqbal, M., R.H.J. Verkerk, M.J. Furlong, P.C. Ong, A.R.Syed and D.J. Wright. 1996. Evidence for resistance to Bacillus thuringiensis (Bt) subsp. Kurstaki HD-1,Bt subsp. Aizawai and Abamectin infield populations of Plutellaxylostella fromMalaysia. Pesticide Sci., 48:89-97.
18. Kashif, Z.A. 2006. A Study into the Adoption of Wheat Management Practices among Wheat Growers of Tehsil Faisalabad. (unpublished masters thesis) Inst. of Agricultural Extension, University of Agri., Faisalabad-Pakistan.
19. Knapton, S. 2014. Healthy diet means 10 portions of fruit and vegetables per day, not five. (Online) http://www.telegraph.co.uk/news/science (Website accessed on April, 2016).
20. Latif, M. 2009. Compatibility of two methods for assessing the need of small scale cotton growers in Kamal Pur union council district Muzafargarh. (unpublished masters thesis) Inst. of Agricultural Extension, University of Agri., Faisalabad-Pakistan.
21. Midmore, D.J. and H.G.P. Jansen. 2003. Supplying vegetables to Asian cities: is there a case for peri-urban production? Available at: http://www.elsevier.com/locate/foodpol:13-27
22. Muro, P. and F. Burchi. 2007. Education for rural people and food security a cross country analysis. Food and Agriculture Organization of the United Nations, Rome. ftp: // ftp. fao. Org / docrep / fao / 010 / a1434e / a1434e.pdf.
23. Patil, M.R., S.D. Patil, R.K. Rahane and S.S. Bhosale. 2012. Effect of technology adoption on onion production in Maharashtra. Trends Life Sci. 1(3):53-56.
24. Radhakrishna, R.B. 2007. Tips for Developing and Testing Questionnaires/Instruments, JOE, 45(1) [online] http://www.joe.org
25. Rao, A.V. and L.G. Rao. 2007. Carotenoids and human health. Pharmacological Res. 55(1):207–216.
26. Rehman, M., Jehanzeb and M.F. Rana. 2008. Livelihood strategies of different categories of households in rural areas of Abbottabad, Pakistan. Sarhad J. Agric. 24(4):685-692.
27. Reinfried, S., Y. Schleicher and A. Rempfler. 2007. Geographical views on education for sustainable development. Lucerne Symposium, Switzerland.

28. Talib, U. 2012. Role of agricultural extension 'Hub programmes in the dissemination of improved agricultural technologies among farmers in Tehsil Faisalabad. (unpublished master's thesis) Inst. of Agricultural Extension, University of Agri., Faisalabad.
29. Wang, X., D. Pasqua and A.J. Govind. 2011. Selective depletion of mutant p53 by cancer hemopreventive isothiocyanates and their structure-activity relationships. J. Med. Chem. 54(3):809-816.

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