ECONOMICS OF PERI-URBAN RADISH PRODUCTION AND MARKETING IN FAISALABAD

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ABSTRACT:- This study uses primary data collected from 70 radish growing farmers selected randomly from peri-urban area of district Faisalabad, Pakistan. It was found that majority of farmers were not following recommendations of the agriculture department regarding seed rate, fertilizers, and irrigations. Majority of respondents (94.2%) reported the local Meno as the best yielding variety. Imported and 40 day varieties were not popular as only 5.8% farmers were cultivating these varieties in the study area. On the basis of survey data, benefit cost and total factor productivity analyses depict that radish cultivation is a profitable enterprise in the study area. Productivity gap between current and potential yield of radish can be minimized by the adoption of recommended production and marketing practices.

Key Words: Radish; Peri-Urban; Benefit Cost Ratio; Factor Productivity; Marketing; Pakistan.

INTRODUCTION

Many vegetables are grown mainly near the urban centers in the country (Bakhsh et al., 2006). This is a profitable business because of local consumption and marketing as well as export for earning income (Tunio and Majeedano, 2001). Statistics indicate that Sheikhupura, Sahiwal, Kasur, Toba Tek Singh, Rahim Yar Khan and Okara are major vegetable growing districts in Punjab but production trends fluctuate in response to prices in the market (Bakhsh et al., 2006). Vegetable crops are very important due to their higher yield potential, low cost of production and higher nutritional value. Vegetables are comparatively rich source of vitamins and minerals, which are essential for the maintenance of good health and resistance against diseases. Besides providing crucial dietary nutrients, vegetables generate far higher income than the staple food and cash crops such as wheat and cotton. Moreover, they help to improve the productivity and sustainability of the cereal-based production system (Ali and Abedullah, 2002). Being the labour intensive crops, vegetable cultivation generates higher employment opportunities at the farm level than cereals (Abedullah et al., 2002).

The cultivation of vegetables at commercial level has been relatively un-satisfactory due to ignorance of these crops in research and extension

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policies. This results in relatively smaller percentage of cropped area under vegetable cultivation (Ahmad et al., 2003). The per capita per day consumption of vegetable in Pakistan is almost half of the recommended level of 200g per person per day (Farooq and Ali, 2002). Most commonly grown vegetables include potato, onion, tomato, chilli, gourds and melons etc. Among winter vegetables radish is highly profitable crop which can be grown in almost every season on all types of soils but spreads well in light, nutrient rich and moist soils in shorter plantation time.

According to an estimate, total vegetable area and production of radish in Pakistan has seen increasing trend during 2002-03 and 2011-12 from 520.9 to 611.7 thousand ha and production from 6454.2 to 8478.8 thousand tonnes, respectively. Punjab province has comparatively higher share in area (60%) and production of vegetables (67%) including potato and condiments. Radish yield at farm level (16.2 t ha^{-1}) is much less as compared to that at experimental stations (30 t ha^{-1}) which results in almost 46% yield gap (GoP, 2012).

Policy makers and planners primarily always need information on essential cereal crops, but now-a-days due to persistent price hikes especially in the vegetables, policy makers and planners have started giving importance to the vegetables. This needs latest information on vegetable production and marketing statistics. Economic analysis of vegetables has been conducted by many researchers over the 1st decade of 21st century (Muuttama, 2000; Bakhsh, 2002; Ahmad et al., 2004; Bakhsh and Hassan, 2005; Hassan et al., 2005). The focus of these studies remained on the determinants of profitability and estimated profitability with reference to yield levels. The location of the vegetable growers and the difference of the production technologies used by growers other than the recommended production technologies have not been investigated.

Keeping in view the production and yield gap issues as well as monetary benefits associated with radish cultivation, present study was designed to compare and contrast the cultural practices of farmers with the recommended cultural practices of agriculture department, estimate cost of production, explore ways and modes of radish harvesting and marketing to put this remunerative crop on scientific lines.

MATERIALS AND METHOD

Data Collection and Sampling

Vegetable cultivation is mostly concentrated near urban and peri-urban centres where production and marketing is easy due to cheaper availability of inputs and labour. The peri-urban areas of district Faisalabad were selected for data collection duly focusing on the use of sewage water in radish cultivation. Convenient sampling technique was followed to collect primary data from 70 radish growers during 2010-11. Survey data contained information about farm level characteristics, acreage under radish crop, use of seed and sewage water, input and output statistics as well as materials and methods used in harvesting and marketing of the produce. Descriptive statistics of various variables were worked out and accordingly the cost

of production, benefit cost ratio and factor productivity analyses were performed.

Data Analysis

Total Factor Productivity (TFP)

It is the ratio of output to the aggregate of inputs. These ratios are calculated dividing the monetary values of output and inputs. Higher values of TFP analysis will indicate that radish cultivation may bring more revenue on additional investment of rupee for purchasing all inputs required for radish cultivation.

Partial Factor Productivity (PFP)

It is the ratio of output (monetary terms) to that of some specific input (monetary terms), the productivity of which is to be determined. Higher value of partial productivity of any factor of production means that the use of that particular input is cheaper in the production activity and vice versa. In other words, findings of productivity analysis in the agriculture sector are helpful to the farmers in making judicious use of factors of production (inputs) in suitable enterprises because the increase in productivity, total production, extent under cultivation, per capita availability and consumption as well as the demand and volume for export are the progress indicator of any crop.

RESULTS AND DISCUSSION

Farm Characteristics

Almost all the vegetables are grown on small land pockets. Similarly, with radish which according to 37% respondents, was being cultivated on very small acreage (less than 1 acre) and least number of farmers (11%) had maximum area under radish (8 acres). Bakhsh (2006a) also found that the radish cultivation suits well for those, who possessed small land holdings and the limited financial resources. Government has registered and released three varieties of radish as developed by Vegetable Research Institute, Ayub Agricultural Research Institute, Faisalabad. These varieties are Meno early, 40 day and Lalpari. Results revealed that majority of farmers (97%) were sowing recommended radish varieties. Majority of respondents (94.2%) reported the local Meno as the best yielding variety of radish. Imported and 40 day (another local approved variety) was not much popular as only a few farmers (5.8%) were cultivating this variety in the study area. Results showed that local varieties of radish were suitable in the local agro-climatic conditions of the study area and imported varieties were not popular and successful. According to Kushk and Hisbani (2003) the farmers of Sindh province were also growing local varieties of radish which were low yielding.

There were mainly four sources of purchasing radish seed namely, research station, seed dealers, fellow farmers and home-kept but major source was seed dealer as majority of the farmers (85.7%) purchased seed directly from dealers. Despite the presence of agricultural research station in the study area, farmers preferred to purchase seed from seed dealers and 8.6% farmers purchased seed from the research station. One possible reason might be the cheap and easy availability of seed from seed dealers of the area. In radish crop, broadcast and hand sowing (*chopa*)

methods were common as about 77.1% respondents were sowing radish with broadcast method.

Time of sowing affects the timely production and profit of the crop. Radish was grown in peri-urban areas of Faisalabad city in March during *rabi* and from July to October during *kharif* season (Table 1). Respondents said that March, July and August are not favorable for radish cultivation and only 14.3% farmers were cultivating radish in these months. Majority of the radish growers selected September (48.6%) and October (37.1%) as the ideal time for sowing radish seed and earning money perhaps due to its high demand in the local market at that time. According to Kushk and Hisbani (2003), radish sowing in the Sindh province starts in the last week of September and continues till last week of October depending upon the agro-ecological conditions.

Majority of farmers (75%) obtained lower radish yield (8000-12000kg acre^{-1}), while 25% growers obtained higher yield (12000-16000 kg acre^{-1}) (Table 1). National average yield of radish at farm level is 6520 kg acre^{-1} whereas government has recorded yield potential of radish on experimental farms as 12120kg acre^{-1} (GoP, 2012). In Sri Lanka radish variety, Japanese Ball, is considered a high yielding variety whose potential has been seen more than 20240 kg acre^{-1} (Government of Sri Lanka, 2002). Comparing the radish yield potentials with the study results reflect that farmers of peri-urban area in Faisalabad district were performing well regarding yield per acre. However, quality (accumulation of fibrous) and perishability aspects of radish had not been focused in the present research which needs further research before making comprehensive comparison about radish at farmer's and experimental farms.

Production Practices

These include land preparation, seed rate, farm yard manure and fertilizer application, irrigation, and weeding. Results showed that farmers ploughed the land 3-15 times (avg. 7.46) for soil preparation for radish cultivation. After ploughing,

Table 1. Farm characteristics of radish growers

Variable	Count(%)
Area	
<1 acre	26(37)
1 - 2 acres	24(34.3)
2 - 3 acres	12(17.1)
>3 acres	8(11.6)
Variety	
Meno	66(94.2)
40 day	2(2.9)
Imported	2(2.9)
Sources	
Seed dealer	60(85.7)
Research station	6(8.6)
Fellow farmers	2(2.9)
Home-kept	2(2.9)
Method of sowing	
Broadcast	54(77.1)
Hand sowing	16(22.9)
Month of sowing	
March	4(5.7)
July	2(2.9)
August	4(5.7)
September	34(48.6)
October	26(37.1)
Yield (kg acre^{-1})	
8000-12000	54(77.1)
>12000-16000	16(22.9)

Source: Survey Data 2010-11

on average 3.86 plankings were also done for making seed bed suitable for germination of seed (Table 2). Provincial agriculture department recommends 4 ploughings with 2 plankings for well prepared and leveled soil for radish cultivation. In this scenario farmers were over cultivating the land and accordingly wasting the money.

Farmers of the study area were using 2-6 kg radish seed and the average seed rate was 3.86 kg which is more than the recommended seed rate of 2.5 - 3.0 kg acre^{-1}. In Sindh province, Kushk and Hisbani (2003) noted that the farmers were using 2.0 -2.5 kg acre^{-1} seed (Table 2). The results showed that farmers were applying seed in excess than the recommended amount. Proper advisory services provided to farmers regarding the recommended use of seed may enhance the yield as well save financial resources.

The farm yard manure (FYM compost) is recommended scientifically as a natural fertilizer which improves soil aeration, structure and enhances the soil fertility as well as boosts the production of crops. Farmers were applying less dose of FYM (avg. 2.10 tractor trolleys per acre) directly at the time of radish cultivation. In radish fields, FYM is usually recommended @ 3.0 - 3.5 trolleys per acre at least one month before sowing of radish seed (Table 2). It means farmers were using less manure at an inappropriate time as compared to recommendations. According to Burt (2005) compost is not normally used directly before radish, but using this @ 50 m^3 ha^{-1} to other crops in the rotation will be beneficial. It will supply organic manure, add nutrients as well as help to retain moisture in the soil. The direct application of compost in radish may affect the quality of produce. Kushk and Hisbani (2003) also recommended well rotten FYM

Table 2. Descriptive statistics of major farm operations

Variables	Farmer's practices				Recommended practices
	Minimum	Maximum	Deviation	Mean	
Ploughing (No.)	3	15	2.616	7.46	4
Planking (No.)	2	6	1.240	3.86	2
Seed Rate (kg acre^{-1})	2	8	1.672	4.31	2.5 - 3.0
FYM Trollies (No.)	0	3	1.097	2.10	-
Urea bags (No.)	0	4	0.919	1.51	-
DAP bags (No.)	0	4	0.843	0.74	-
NP bags (No.)	0	2	0.404	0.11	-
SSP bags (No.)	0	2	0.338	0.06	-
Tube-well waters (No.)	2	6	0.985	3.97	-
Canal waters (No.)	0	5	1.218	2.60	-
Sewage waters (No.)	0	1	0.505	0.54	-
Weeding	0	15	5.747	6.29	-
Weedicide	0	1	0.236	0.06	-
Insecticide	0	3	0.919	0.54	-
Total sprays (No.)	0	3	1.027	0.60	1

Source: Survey Data 2010-11

before sowing of radish seed. Excess use of FYM, followed by inappropriate application timings may affect quality of radish stock.

Chemical fertilizers are another source of providing rich nutrients to the soil in the form of nitrogen, phosphorous and potash which enhances growth and the yield of the crop. Farmers were using maximum 6 bags but on average, farmers were using 2.42 bags of various fertilizers including DAP or SSP with urea (Table 2). Generally 1.5-2.0 bags of mix fertilizers are recommended but the farmers were applying a little higher than the recommended dose. Farmers were using excess applications of chemical fertilizers which may incur financial loss to the farmers on one hand and may deteriorate quality of radish on the other hand. Moreover, the easy washing of nitrogen, potassium and phosphorous in sandy soils may lead to underground water pollution.

Tube-well irrigations were major source of watering the radish fields and farmers were applying 2-6 waters for cultivation of radish (Table 2). Average tube-well irrigations were reported as 3.97. To supplement deficient tube-well irrigations, farmers of the study area were applying a maximum of 5 canal irrigations. On an average, 2.60 canal irrigations were applied to radish crop (Table 2). As the present study was conducted in peri-urban areas of the city, where though sewage water was abundant but majority of farmers were not applying it being considered harmful to the crop as well as to human health. Maximum one application was recorded in sewage water application (Table 2). Similarly, much lower average number of sewage irrigations (0.52 irrigations) further supports the above view point of health risks associated with the use of sewage waters.

The recommended number of irrigations is 12-16 for maturity of radish crop (Table 2). In the study area, on an average 7.11 irrigations to radish crop were applied which are much lower than the recommended irrigations. Bakhsh (2006a) also noted only 5.76 irrigations for radish crop grown in the Sahiwal and Sheikhupura districts which have large share in vegetable production of Punjab. Farmers may not witness potential output without applying necessary irrigations in the July-August or September sowing seasons.

Although radish is a short duration crop and grown on small land holdings, thus weeding is not a serious problem. Farmers were doing weeding twice considering the nature and intensity of problem. Results also show that maximum 15 labourers were engaged for manual weeding and average number of labour was 6.29 labourers. The application of sprays for weeding purposes was not a common practice for radish crop as 0.06 weedicide on an average were sprayed (Table 2). Radish crop is also susceptible to attack of insects and pests for which farmers use insecticides. The survey results revealed that some farmers were not applying insecticides whereas maximum 3 sprays were noted in insecticide adopters. But less average number of sprays (0.54) indicates the less insect attack on the crop in the study area. Agriculture department recommends from one to a few number of applications depending upon the intensity of insects. Farmers were making judicious use of weedicide and insecticide sprays as evident from average

number of 0.6 applications of weedicides/insecticides (Table 2).

Cost of Production

Radish cultivation involves economic and resource allocation decisions because it is not only growing radish on available piece of land but also requires proper care and application of inputs to the targeted or other competing crop depending on the costs required for production. Main variable costs incurred on radish cultivation consist of land preparation along with sowing cost of seed, price of seed, cost of fertilizers, irrigation and insect-pest management charges, and harvesting cost. These and other related expenses like labour charges at the time of land preparation, seed sowing, application of waters, fertilizers and weeding stages, etc. were also worked out for estimating per acre cost of production of radish crop. Opportunity costs were also worked out on the basis of market values of certain variables for inclusion in the analysis. Main expenditures were incurred on fertilizers (chemical and compost), harvesting and land preparation including sowing charges which were 31%, 17% and 16%, respectively. Least cost (only 6%) was incurred on purchase of seed. Adoption of use of recommended fertilizer, efficient labour management, appropriate land management and sowing of high quality seed can further reduce the production costs of radish.

The total variable cost amounted to Rs.31032.15 and gross revenue was Rs.66428.57 (Table 3). Thus, net revenue (profit) from cultivation and sale of radish output turned out to Rs.35396.42 per acre. Accordingly, benefit cost ratio (BCR) was estimated at 2.14 which imply that investment of additional one rupee on purchase of inputs for radish cultivation was yielding more than two times revenue/profit. As the ultimate objective of the study was to improve the economic condition of resource poor radish farmers so it may be done by increasing per acre yield and encouraging radish growers to follow the recommended production practices.

Table 3. Cost of production and productivity analysis of radish (Rs. acre^{-1})

Variable cost items	Mean (%)
Land preparation and sowing charges	4942.86 (16)
Seed price	1797.86 (6)
Cost of FYM	3767.14 (12)
Cost of fertilizers	6017.14 (19)
Water charges	3702.86 (12)
Plant protection measures	1901.43 (6)
Harvesting	5328.57 (17)
Transportation charges	3574.29 (12)
Variable costs	31032.15
Gross revenue	66428.57
Net revenue (profit)	35396.42
Total factor productivity	2.14
Partial productivity of FYM	17.63
Partial productivity of irrigation waters	17.94
Partial productivity of IPM measures	34.94
Partial productivity of chemical fertilizers	11.04

Source: Survey Data 2010-11

Productivity Analysis

Total Factor Productivity (TFP)

The overall total factor productivity in crop under study was 2.14 (Table 3). Higher values of TFP analysis indicate that radish cultivation may bring more than two times revenue on investment of additional one rupee for purchasing all inputs required for radish cultivation in the study area.

Partial Factor Productivity

Partial productivities of certain inputs (factors of radish production)

like farm yard manure, fertilizers, integrated pest management and irrigation inputs are described with the help of survey based results (Table 3). Higher partial productivity of 34.94 was noted in the use of integrated pest management practices. Surprisingly partial productivities of both the factors of production i.e., irrigation waters (17.63) and farm yard manure 17.94 were almost same.

Highest value of partial productivity of integrated pest management practices means that the use of that particular input was cheaper in the production activity and vice versa.

Marketing of Radish

Almost all the vegetables are perishable in nature and radish leaves are also susceptible to wilting which may decrease its freshness and market value. The harvested radish crop may be stored in a shady place for a small period as it has relatively smaller shelf life. This factor compel growers not to go for storage of radish produce. Resultantly, vast majority of the farmers (94.3%) did not store the radish to get its good price (Table 4). Majority of the growers (63%) were sorting and grading radish produce to earn higher profit in the market than other fellow farmers. A majority of farmers (65.7%) were using plastic bags as packing material for radish marketing while 28.6% producers opted for loose (using cheaper strings for binding bunches of radish) radish marketing to save money on purchasing costly packing materials. Only 5.7% farmers used jute bags for packing of radish bunches for selling. Farmers were using modern as well as traditional modes of transporting the radish to the market. About 51.4% were using rickshaw for transporting radish produce to the market while 40% producers used traditional cart for this purpose. Only 8.6% farmers were using truck for transporting radish to the market which also reflects that this portion of radish is transported to distant markets. The results revealed that there are four selling places for radish produce in the market. The 54.3% farmers were selling radish in the local market followed by sale at farm level (31.4%). Only small percentage of farmers preferred to sale the produce in the wholesale and distant

Table 4. Marketing strategies adopted by radish growers

(Rs. acre^{-1})

Variable	Count (%)
Storage facility	
Non-availability of storage facility	66 (94.3)
Availability of storage facility	4 (5.7)
Grading for marketing (% farmers)	44 (65.7)
Types of packing material	
Plastic bags	46 (65.7)
Jute bags	4 (5.7)
Loose marketing	20 (28.6)
Mode of transporting radish to the market	
Rickshaw	36 (51.4)
Cart	28 (40.0)
Truck	6 (8.6)
Selling places of radish	
Local market	38 (54.3)
At farm level	22 (31.4)
Wholesale market	6 (8.6)
Far away market	4 (5.7)
Group marketing	
Yes	12 (17.1)
No	58 (82.9)
Market channels	
commission agent	44 (62.9)
Retailer	12 (17.1)
Whole seller	8 (11.4)
Consumers	4 (5.7)
Dealer	2 (2.9)

Source: Survey Data 2010-11

markets. The reason may be the efforts of farmers to save time and cost involved in transportation of the produce to distant markets. Survey results also revealed that 63% farmers were contacting the commission agents for marketing radish produce while 17.1% farmers sold their produce to the retailers. Only a few farmers (only 2 out of 70 sample farmers) sold their produce through the dealer. Almost 83% were going to the market solely/individually 17% farmers were selling radish produce through group marketing.

CONCLUSION AND RECOMMENDATIONS

It can thus be concluded that the radish cultivation in the Faisalabad areas has great potential as growers realized better net returns mainly due to lower production costs of radish. Thus radish cultivation has tremendous scope for further extension in area in relatively shorter time. Study also revealed that farmers are still relying on their traditional knowledge despite the presence of modern production and marketing facilities for vegetables. Such a situation needs immediate attention to make life of subsistence farmers more prosperous on one hand and enhancing agricultural production and productivity of the country on the other hand through judicious use of available resources on small land holdings. Results also show that local varieties of radish like Meno are suitable in the local agro-climatic conditions of the study area because imported varieties are not popular among farmers. It is therefore recommended that for improving the radish production, the existing information system could be modernized followed by proper feedback system to disseminate improved production practices and get problems of the farmers solved timely because appropriate use of inputs through modern production techniques can increase the production and minimize the production costs to a great extent.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

S. No	Author Name	Contribution to the paper
1.	Mr. Rashed Saeed	Conceived the idea, Introduction, Analysis, Results and discussion
2.	Mr. Shoaib-ur-Rehman	Data entry in SPSS and analysis
3.	Dr. Muhammad Qasim	Technical input at every step, Data entry in SPSS and analysis
4.	Hafiz Zahid Mahmood	References, Overall management of the article
5.	Mr. Irfan Mehmood	Technical input at every step, Results and discussion

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