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# AN ECONOMIC ASSESSMENT OF TURMERIC PRODUCTION IN PUNJAB-PAKISTAN

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## ABSTRACT

Study was conducted in main turmeric producing pocket of Pakistan to estimate cost of turmeric production, assess issues in cultivation and marketing sectors and work out feasibility of establishing turmeric grinding units. For this purpose, primary data with the help of well-structured questionnaires covering cultivation and marketing aspects of turmeric were collected from 50 turmeric farmers. Focused group discussions with 10 processors from local trade market were also arranged in order to supplement the sampled data particularly helping in feasibility analysis of grinding unit. Descriptive statistics, economic analysis and feasibility analysis of turmeric grinding unit were performed. Results indicate that output prices of turmeric remain highly un-stable during the season affecting production and processing to a great extent. Cost of production estimates across small as well large farm categories reflects that cultivation of turmeric despite the seasons' lowest market prices (Rupees 696 per maund) of raw turmeric is profitable only to owners of land from both small and large farming categories. In other words, when output prices of raw turmeric in the past were reasonably higher (up to Rs.1000 per maund) then all types of farmers i.e. land owners as well as owner cum tenant had earned almost double returns than costs. On one hand, un-predictable and fluctuating trend in output prices and under-weighing practices by the commission agents and on the other hand, existence of profit margin in processing were inducing growers and processors to add value to raw turmeric for their enhanced incomes. Moreover, processing trend was increasing day-by-day in the study area. Therefore, market linkages need revival among stakeholders. Similarly, national sensitization on turmeric processing could help create awareness and get the attention of government for policy drive.

**Keywords:** benefit cost ratio, cultivation, production costs, turmeric, yield

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## INTRODUCTION

Turmeric is an annual crop which may be sown on sandy or clayey loam soils of Pakistan. Best sowing period is April-May and requires 2500 kg finger rhizomes per acre as a seed. Under organic conditions, 5-6 tons of Farm Yard Manure per acre may be applied for better yield. Usually, it takes 20 to 40 irrigations depending upon the nature of soil. Depending upon the varieties, it takes 6.5 to 9.5 months for maturity when the lower leaves turn yellow. On an average, 20-25 tons of rhizomes (raw turmeric) per acre are obtained (Pakistan Agriculture Research, 2015). Harvesting is done by digging the rhizomes up. Leafy tops are then cut off and the roots and adhering earth is removed. Rhizomes are then cleaned/ washed. Some of these are retained as seed (for replanting in the future). The remainder is processed into turmeric powder. Raw turmeric passes through many stages before reaching end user. To develop the yellow color and characteristic aroma, cleaned rhizomes are first cooked in boiling water for one hour under slightly alkaline conditions. The cooked rhizomes are then dried either artificially or in the sun for 6 to 8 days. Dried rhizomes are finally polished to smooth their exterior and also to improve the color. Dried rhizomes are then sold in this whole form or grinded into a powder. Like other agricultural commodities, role of middlemen in turmeric marketing is also considered as disadvantage to stakeholders. It is argued that middlemen reap huge profits while farmers are forced to sell their products below the cost of production. Middlemen often sell turmeric in international market for five times the original price, which imply that there is steady demand in national and international markets for the produce but cartels fix the price and offer peanuts to farmers.

Keeping in view the increasing demand for natural products as food additives makes turmeric as an ideal item as a food colorant, thus increasing demand for it. Additionally, recent medical research demonstrating the anti-cancer and anti-viral activities of turmeric may also increase its demand in Western countries. Turmeric in the form of fine, dried, yellow powder is mostly used in many religious observances, used as a cosmetic, a dye, and it also enters in the composition of many traditional remedies of inflammation, arthritis, weight loss, asthma, cold and flu and diabetes.

According to KEW GARDENS, India is the largest producer of turmeric, supplying 94% of the world's demand (supplying some 20,000 tonns each year). According to Angles and Hosamani (2002), India is the largest producer as well as consumer of turmeric in the world. Other producers in Asia include Pakistan, Bangladesh, Sri Lanka, Taiwan, China, Burma and Indonesia. Turmeric is also produced in the Caribbean and Latin America: Jamaica, Haiti, Costa Rica, Peru, and Brazil where it is cultivated on a commercial scale and enters the market usually in the form of dried rhizomes which are then given final touch according to their end use. Turmeric is cultivated almost throughout Pakistan. According to Figure 1, Punjab province is major contributor in turmeric production wherein district Kasur is leading with 72% share in total production during the year 2013.

According to another source, major share comes from Kasur district which contributes more than 80% of the country's production (Anwar *et al.,* 2012) with 30569 metric tons annual production from 3157 ha. Turmeric is produced in the country and has local as well as foreign markets for finished product. City Chhanga Manga in district Kasur is main marketing hub in Punjab-Pakistan.

Marketing of turmeric in the country is not regulated properly, therefore, prices of fresh (raw) turmeric fluctuates very frequently in every season. Figure 2 shows this fluctuating trend in prices during last 6 years.

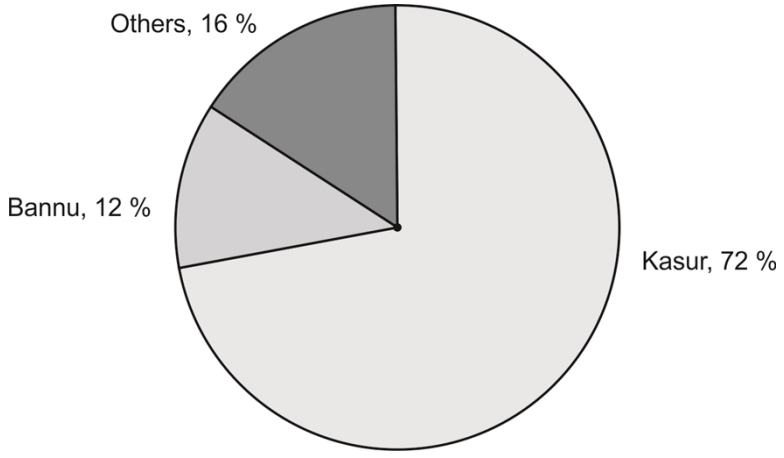
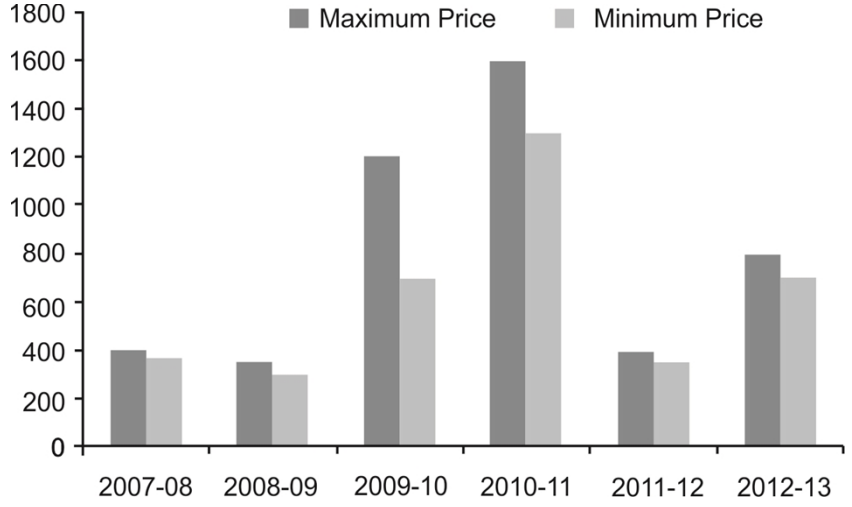


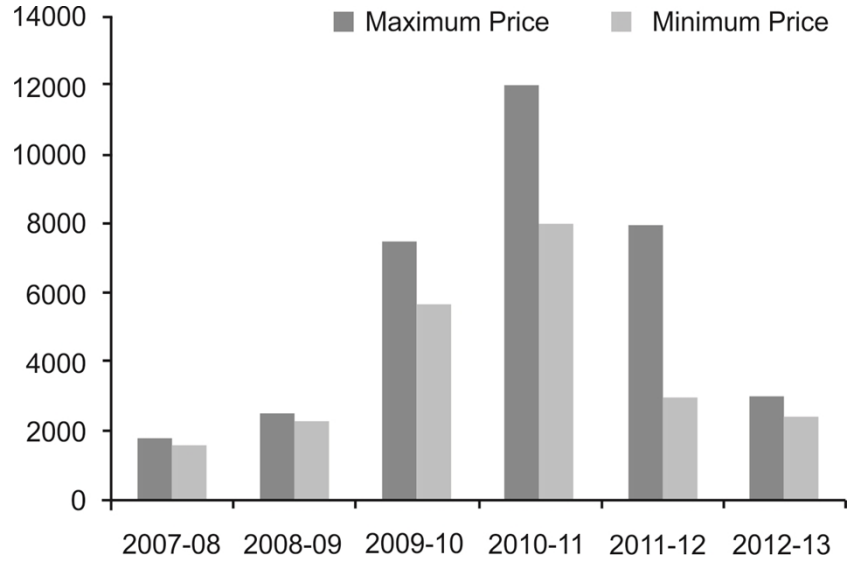

**Figure 1.** Major producers of turmeric in Pakistan (Year 2013)




Source: Turmericpakistan.blogspot.com

**Figure 2.** Fresh turmeric prices of last 6 years

Similarly, prices of powder (well boiled and dried) turmeric also witnessed fluctuations due to lack of regulatory framework by the government. Figure 3 shows this increasing/ decreasing trend in prices of finished turmeric over the same period of last 6 years in the country.




Source: Turmericpakistan.blogspot.com

**Figure 3.** Prices of finished turmeric during last 6 years

In Pakistan, turmeric is considered as minor crop that is why little empirical work has been done on studying functions and opportunities in value chain and economics of turmeric crop as well as issues in cultivation and processing / marketing. This study was, therefore, conducted to examine the socio-economic profile of turmeric growers and the farm, cost of production of turmeric crop by farm size, analyze value chains of turmeric crop, economic feasibility of turmeric grinding unit in the area and the issues faced during cultivation and processing of turmeric.

## MATERIALS AND METHODS

### Study area

Turmeric is cultivated mainly in Punjab Province of Pakistan where in district Kasur is a major belt contributing 80% to country's total turmeric production. However, main hub of turmeric sale and purchase i.e. Chhanga Manga city is in Kasur district from where exporters purchase boiled and dried rhizomes of turmeric or its grinded powder in bulk for onward export to Iran, United Arab Emirates, Sri Lanka, Middle Eastern, USA, UK, Japan and North African countries. These importing countries represent 75% of the turmeric world trade, and are mostly supplied by the Asian producing countries. Europe and North America represent the remaining 15% and are supplied by India and Central and Latin American countries. The United States imports of turmeric mainly come from India at 97%, district Kasur has a total area of 3995 $Km^2$. This district is located near the Indian border. Two rivers namely Sutlej and Ravi River-passing through district Kasur- irrigate lands making them very fertile for turmeric cultivation. Turmeric crop covering more than 19 percent agricultural area

emerges as the second main kharif crop in the study area. Main crops of rabi season are wheat, spring maize, sugarcane whereas rabi fodders and rabi vegetables are also grown intensively. Similarly, rice, turmeric, autumn maize and sugarcane are major crops grown during kharif season. In addition to it, certain vegetables and fodder crops are also grown during kharif season.

**Data collection/analytical techniques**

Farm level data during the year 2014 was collected for the proposed study using personal interview method. Structured questionnaire with close and open ended questions was prepared and pretested in the field for its accuracy and incorporating necessary changes. The farm level data were then collected from overall 50 farmers. Similarly, group discussions with 10 local processors of turmeric were also arranged in order to perform feasibility analysis of turmeric grinding units in the area. Key informant or group discussions have remained helpful in supplementing or validating the primary data at some times during survey. Descriptive statistics such as counts, percentages, means and ratios at some places were used to investigate the socio-economic characteristics of the growers (small and large farm categories) and economic analysis was also carried out to estimate the economics of turmeric crop for both farm categories (small and large farm sizes). In the end, feasibility analysis of turmeric grinding unit was performed in order to recommend establishment of small grinding units for the welfare of local processors. Purpose behind contacting the processors was to determine the types of turmeric products, their quality and the manpower (males and females) directly involved in their production, and to evaluate the methods including instruments used in processing, with the final aim of identifying issues and opportunities for enhanced value addition on scientific lines.

## RESULTS AND DISCUSSION

This section first describes productivity of turmeric, followed by issues and value chain analysis.

**Acreage allocation, productivity and price of turmeric by farm size groups**

Farmers of the study area are known as founders in cultivation of turmeric in district Kasur. Small farmers were growing turmeric since last 14 years whereas large farmers started growing it 17 years ago. Overall, turmeric is being grown in the area from more than 15 years. There was significant variation between area allocated to turmeric production by small farmers (1.73 acres) and large farmers (4.5 acres). Out of 50 respondents, some farmers (Frequency=16) were found selling standing crop of turmeric depending upon their needs. Selling the standing crop was not common practice as bargaining was risky. Small farmers received higher sale price (Rs.122222/acre) upon selling standing crop as compared to large farmers (Rs.105428/acre). Average sale price of standing crop was Rs.114875/acre (Table 1). Small farmers sold standing crop after crossing 8 months of cultivation, whereas large farmers sold before 8$^{th}$ month of crop. It implies that more matured crop gives higher sale price to small farmers. In the present study, large farmers wanted to sow wheat well in time, thereby, sold standing crop earlier as compared to small farmers. Anyhow, late the harvesting

is, higher will be the yield. In Nepal, turmeric is harvested after 9 months or 2 years depending upon the needs. The two years harvesting has bigger size and higher weight and is considered to be of better quality by the processors (Govt. of Nepal, 2011). Usually, turmeric production was carried out jointly by the males and females. There was no significant difference in wages in both the farm categories. As large farmers received higher price, similarly, they got higher yield of 159 maund from an acre as compared to small farmers who received 144 maund/ acre. Average raw turmeric yield of 151 maund/ acre was reasonable yield as compared to previous years of 2011-12 and 2012-13 when per acre yields of turmeric were 108.8 maund and 91.8 maund, respectively (GoP, 2013). Yield of turmeric in the country is reasonable good as compared to neighboring countries like Bangladesh and India. During the year 2014, Bangladesh Bureau of Statistics reported an average raw yield of 93 maund per acre in the country. In Indian district of Tamil Nadu, farmers obtained lower yield of 79.29 maund per acre during the year 2013 (Kiruthika, 2013). This higher yield in Pakistan might be due to somewhat better soil fertility status as turmeric is being grown in neighboring countries since generations causing decline in soil fertility.

**Table 1.** Acreage allocation, productivity and price of turmeric by farm size groups (n= 50)

| Queries | Farm size groups | | All | Sig. |
|---|---|---|---|---|
| | Small | Large | | |
| Start of turmeric growing (Year) | 14.13 | 17.05 | 15.24 | .347 |
| Average area under turmeric (Acres) | 1.73 | 4.47 | 2.76 | .000 |
| Sale price of standing crop (Rs./Acre) | 122222.22 (9) | 105428.57 (7) | 114875.00 (16) | .149 |
| Age of standing crop (Months) | 8.17 | 7.72 | 8.01 | .282 |
| Normal maturity period (Months) | 8.42 | 8.68 | 8.52 | .403 |
| Wage rate for male labor (Rs./Day) | 416.66 | 410.53 | 414.28 | .634 |
| Wage rate for females (Rs./Day) | 211.67 | 205.26 | 209.18 | .413 |
| Farm gate price of raw turmeric (Rs./Maund) | 685.16 | 706.05 | 696.85 | .565 |
| Yield of fresh turmeric (Mds/Acre) | 144.35 | 158.74 | 150.85 | .246 |

Note 1: “n” represents sample size Note 2: figures in parenthesis represent frequency against special query, Source: Field Survey, 2014

**Production practices by farm-size groups**

Farm size comparison revealed that among various inputs, large farmers applied higher applications on land preparation, organic and chemical fertilizers and plant protection measures. Large farmers resultantly incurred more costs on turmeric cultivation as compared to small farmers. On the other hand, small farmers made use of greater quantities of seed and hoeing as compared to large farmers.

Table 2 further shows that both small and large farmers of turmeric crop were well aware and using laser leveling technology. Turmeric is the crop which is totally harvested manually. On an average, one dozen persons were required to harvest one acre of turmeric in 3 days.

**Table 2.** Production practices by farm-size groups (n = 50)

| Operations | Farm categories | | | | | |
|---|---|---|---|---|---|---|
| | Small farms | | Large farms | | All | |
| | Mean | S.D | Mean | S.D | Mean | S.D |
| Seed rate (Mds/Acre) | 14.29 | 2.735 | 13.84 | 1.608 | 14.12 | 2.362 |
| FYM (No. of Trollies/ Acre) | 1.52 | 1.313 | 2.37 | 1.342 | 1.84 | 1.376 |
| Tube-well irrigations (No) | 22.94 | 9.508 | 20.95 | 7.807 | 22.18 | 8.870 |
| Canal irrigations(No) | 11.39 | 6.960 | 13.84 | 7.932 | 12.32 | 7.364 |
| Hoeing operations (No) | 1.00 | .894 | .79 | 1.084 | .92 | .966 |
| Pesticide sprays (No of sprays) | 1.03 | .836 | 1.42 | 1.216 | 1.18 | 1.004 |
| Weedicides (No of sprays) | 1.65 | .661 | 2.00 | 1.155 | 1.78 | .887 |

Note: “n” represents sample size Source: Field Survey, 2014

**Turmeric processing and marketing functions by farm size groups**

A little quantity of turmeric may be lost in the field during harvesting. Results showed that there was negligible difference of harvesting loss between small and large farms. Out of 50 sample farmers, 41 respondents reported overall loss of turmeric at 3.1 percent. Sample respondents were performing processing as well in addition to cultivation. Out of 50 respondents, very few growers (19 Nos.) were found adding value to the turmeric by bringing fresh turmeric into boiled and dried rhizomes or grinded/powder form. Out of these 19 grower cum processors, processing activity was mainly carried out by small farmers (Frequency=11) as compared to large farmers (Frequency=8). Anyhow, the large farmers may be regarded as innovators as they took start earlier as compared to small farmers as it is evident from Table 3. Out of 19 grower cum processors, 18 respondents preferred processing activity over selling of raw turmeric. Overall two third respondents preferred processing activity due to higher profit margin in selling turmeric in boiled or powder form. Issue of under-weighing by commission agents was regarded as second main reason behind involvement in processing. Out of 19 processors, 18 respondents reported to the query regarding level of processing. According to the respondents, they perform processing up to boiling and polishing stage because grinding of boiled and polished rhizomes is cumbersome activity. Moreover, growers have no personal grinding units which also need manpower to operate and therefore, difficult to handle units along with farming activities.

During survey, it was observed that some turmeric growers kept their own produce for self-processing of turmeric and some purchased fresh turmeric in addition to their own output for carrying out value addition. Big processors often import boiled and polished rhizomes from India and Burma in order to grind and mix with local turmeric powder for selling on higher prices. But local processors had comparative advantage over imported turmeric as local turmeric offered great satisfaction due to good aroma and color liked by consumers. Out of 19 respondents, 14 respondents reported that own turmeric quantity was ranged

from 327 to 773 maunds with average quantity of 550 maunds is kept for processing in a season. In addition to owned volume, some purchased raw turmeric from fellow farmers or market in order to add value to it. In present scenario, only 4 cases out of 19 processors purchased turmeric rhizomes in addition to own volume. Large farmers purchased almost four times higher quantity (20000 maunds) as compared to small farmers (4593 maunds).

Generally, processing covers boiling and drying the boiled turmeric rhizomes in the sun (stage may be called as polishing stage) and finally grinding the well dried rhizomes in the grinding mill. When fresh turmeric passes through these stages, it becomes dry powder. The dried quantity is reduced as compared to raw turmeric. Study results based upon the knowledge of 33 respondents out of 50 sample farmers, revealed that output shrinks to 1/5$^{th}$ of the raw turmeric amount after boiling and drying stage. In other words, 4/5$^{th}$ (80 %) of raw turmeric are considered as processing loss as a result of shrinking (boiling and drying) activity of turmeric. Such type of loss in Pakistan is on higher side as compared to India where processing losses are 2/3$^{rd}$ (67 %) of raw turmeric at processing stage (Patil *et al.*, 2009). However, processing losses are at par in Bangladesh where 5 kg of raw turmeric yields 1 kg of dried turmeric after processing but their processing costs are 2.4 times less (Rs.2530 per acre) as compared to processing costs (Rs.6100 per acre) in Pakistan (Government of Bangladesh, 2014). Value added product can be stored over longer periods without compromising on quality in hope of good prices. Processors can give reply to query relating to storage life of boiled or powder form, therefore, 12 respondents out of 19 processors reported that on an average, dried turmeric might be stored for 4 years. Similarly, few processors (2 Nos.) reported that powder turmeric can easily be stored up to 3 years. Storage statistics shows that turmeric in powder form could not be stored over longer periods as compared to dried turmeric because there are more chances of fungal attack on powdered turmeric causing change in color.

**Major issues in cultivation and processing/ marketing**

All sample respondents were asked to identify and prioritize issues faced during cultivation and processing/ marketing activities. Issues like low and fluctuating output prices, annually declining yield of turmeric crop, rising pH of the soils due to exhaustive nature of crop, costly inputs, shortage of canal water, malpractices by the commission agents, lack of know-how about price signals and lack of advisory role by government were identified in cultivation and marketing side. According to results, prime issue was low and fluctuating prices of output followed by second important issue of leaf viral attack as reported by majority of respondents (32 percent) and 20 percent, respectively. These identified issues have been classified into two sectors i.e. cultivation and marketing for easy understanding of issues as given in Table 4.

In turmeric cultivation, leaf viral attack was overall major threat to turmeric crop which may cause a yield loss up to 25 maunds per acre as reported by 20 percent majority of respondents. Second major issue was annually declining yield of turmeric crop. Among other issues in cultivation include rising pH of the soils, exhaustive nature of the turmeric crop and shortage of the yield increasing canal water. Inbasekar (2011) also identified pest and disease, high labor cost, water

scarcity, and low price of output like problems in cultivation of turmeric in Andhra Pradesh. Addressing these identified issues is the need of time for sustaining turmeric production. Crop rotation, provision of canal water and soil testing facility to the doorstep of farmers may improve the turmeric yield considerably. There was limited outreach of input supply companies and government farm services for encouraging farmers to cultivate and process turmeric. Only 2 percent sample farmers reported access to advisory services of Agriculture Extension Department but it was limited to turmeric cultivation, not towards marketing aspects.

**Table 3.** Turmeric processing and marketing functions by farm size groups

| **Characteristics** | **Farm size groups** | | **All** |
|---|---|---|---|
| | **Small** | **Large** | |
| Loss at harvesting (Percent loss) Reported by n = 41 | 3.1<br>(26) | 3.0<br>(15) | 3.1<br>(41) |
| Involvement in turmeric processing Reported by n = 50 | (Percent farmers) | | |
| Involved | 35.5<br>(11) | 42.1<br>(8) | 38.0<br>(19) |
| Not involved | 64.5<br>(20) | 57.9<br>(11) | 62.0<br>(31) |
| Total | 100<br>(31) | 100<br>(19) | 100<br>(50) |
| Start of processing (No. of Years) Reported by n = 19 | 4.3 | 6.8 | 5.3 |
| Reasons of processing Reported by n = 18 | (Percent farmers) | | |
| 1) Higher profit margin | 77.8<br>(7) | 55.6<br>(5) | 66.7<br>(12) |
| 2) Under-weighing practices | 22.2<br>(2) | 44.4<br>(4) | 33.3<br>(6) |
| Total | (100)<br>9 | (100)<br>9 | (100)<br>18 |
| Boiling and drying stage(Percent farmers) Reported by n = 18 | 55.55<br>(10) | 45.45<br>(8) | 100<br>(18) |
| Domestic quantity for processing (Maunds) Reported by n = 14 | 327.1<br>(7) | 773.5<br>(7) | 550.0<br>(14) |
| Purchased quantity for processing (Maunds) Reported by n = 4 | 4593.33<br>(3) | 20000.0<br>(1) | 8445.0<br>(4) |
| Proportion of raw to dried turmeric. Since {fraction (ratio) is converted to decimals} Reported by n =33 | 0.20<br>(19) | 0.23<br>(14) | 0.21<br>(33) |
| Storage life of processed products | (Years) | | |
| Storage life of boiled/ dried turmeric Reported by n = 12 | 4.0 | 4.6 | 4.2 |
| Storage life of powdered turmeric Reported by n = 2 | 5.0 | 2.0 | 3.5 |

Note 1: “n” represents total number of respondents in respective queries,
Note 2: Figures in parenthesis are frequencies. Source: Field Survey, 2014

In turmeric marketing, 32 percent respondents reported that lower and frequently fluctuating prices in the market was a main issue. Under-weighing of raw turmeric by commission agents and lack of market information, etc. were some other critical issues in marketing (processing). Khose *et al.* (2014) also noted similar problems in Indian state of Maharashtra. Among those, lack of market intelligence was reported by 70% respondents as a major issue. Non-remunerative price, lack of marketing and transport facilities were reported as second and third important problems in marketing of turmeric in Maharashtra. Literature suggests that such type of problems mainly arise due to lack of market regulatory system on the part of government. Absence of wholesaler or intermediaries in marketing channel is the characteristics of regulated market. On one hand, regulated markets improve marketing efficiency and on the other hand, it enhances share of the producers in consumer rupee. According to Amarnath and Sridhar (2015), regulated markets have better performance. They found that absence of wholesaler in the marketing channel yields 77% higher share for farmer due to low price spread in marketing of turmeric. Therefore, government should pay special attention in attending such type of marketing problems.

**Table 4.** Major issues in cultivation and processing/marketing (n=50)

| Characteristics | Farm size groups | | All | Sig. |
|---|---|---|---|---|
| | Small | Large | | |
| A) Identified Issues in Cultivation | (Percent farmers) | | | |
| Viral attack on leaves | 16.2 | 26.3 | 20.0 | .382 |
| Annually declining turmeric yield | 12.9 | 21.0 | 16.0 | .445 |
| Rising pH and exhaustive nature of crop | 16.2 | 10.5 | 14.0 | .579 |
| Costly inputs but less returns | 3.2 | 5.2 | 4.0 | .721 |
| Shortage of yield increasing canal water | 6.4 | 0 | 4.0 | .258 |
| Role of Government as a facilitator in production / processing / marketing | 3.2 | 0 | 2.0 | .429 |
| B) Identified major issues in marketing | (Percent farmers) | | | |
| Low and fluctuating prices in market | 35.5 | 26.3 | 32.0 | .500 |
| Malpractices by the Commission agents | 3.2 | 1.5 | 4.0 | .721 |
| Lack of know-how about price signals | 0.0 | 5.2 | 2.0 | .197 |
| No comments | | | 2.0 | |
| Total Percentage | | | 100 | |

Source: Field Survey, 2014

**Cost of production analysis by farm size groups**

Based upon Benefit Cost Ratio, it can be said that large farmers were earning more profit as compared to small farmers. Overall BCR of 1.26 (excluding land rent) reflects that farmers were doing their level best to make turmeric cultivation as a profitable enterprise in the study area. During discussion sessions, respondents of the area desired a minimum price of raw turmeric at Rs.1000 per maund keeping in view the escalating prices of inputs in the period of study. If such prices would have been ensured then a higher BCR of 1.81 would had been possible at the existing level of turmeric production@150 maund per acre. Patil *et al.* (2009) worked out a BCR of 1.33 while studying costs of turmeric production

in Indian state of Maharashtra. Similarly, Inbasekar (2011) also determined a higher BCR of 1.93 from cultivation of turmeric in Andhra Pradesh. Maharashtra and Andhra Pradesh states are one of those Indian states where agriculture system is highly developed mainly because of input subsidies in irrigation, fertilizers and electricity. Similarly, Bangaldeshi farmers were also earning a huge benefit from turmeric cultivation as depicted by a BCR of 2.04 (Government of Bangladesh, 2014). Therefore, three reference studies have higher BCR's due to lower costs and better incomes from turmeric production and better crop husbandry practices, followed by foreign farmers.

**Percentage share of major inputs in cost of production (average farmer)**

Last column in Table 5 shows that major cost on turmeric cultivation came on fertilizer (synthetic and natural), which was nearly 29 percent of total variable costs (TVC). Second main costly item was irrigation water which consumed nearly 25 percent of total variable costs. Third costly item was the seed cost as well as sowing charges which were nearly 18 percent of total input costs. In India, which is regarded as largest turmeric producer in the world, ranking of costly inputs is reverse there because irrigation and fertilizers inputs are highly subsidized in Indian agriculture system. For example, Patil *et al.* (2009), found planting material as main costly item in turmeric cultivation in India which counted around 30 % percent of total variable costs. Similarly, Baskaran (2012) also reported that planting material is highly costly item constituting around 18 % of total variable costs in turmeric cultivation in India. Government of Bangladesh (2014) also reported that seed and sowing charges was major costly item accounting for 33 % of turmeric cultivation cost in Bangladesh. Ranking of costly inputs does not matter rather these are net returns from a crop which are useful in comparing and deciding about success of a crop. For example, net returns per acre in these reference studies were almost double due to lower production costs and accordingly higher net returns as compared to study under hand.

Here in present study, overall tenant farmers across all categories were in total loss situation on account of lower prices in the season. In other words, land owner farmers were somewhat in better position to cover cost of production in these worse days of lower market prices. As described in the background, a look on past 5 years of turmeric reveals that during year 2010-11, all the turmeric growers had earned much higher profits as compared to production costs because prices of fresh turmeric in Pakistani markets had remained in favorable range of Rs.1300 to Rs.1600 per maund. In the nutshell, average yield in country was not an issue rather significant benefits of turmeric farmers was concern that may be improved if costly inputs like fertilizers, irrigation and planting material, etc. are provided on cheaper rates or markets are regulated by government functionaries because costly inputs accompanied by fluctuating and low prices of raw turmeric have great implications on profitability.

**Value chains analysis**

We found very few numbers of turmeric growers involved in processing of turmeric due to laborious and intensive care requiring processing activities over the longer periods. Table 6 describes respective costs and profit margin of different stakeholders i.e. farmers, boilers and grinders or whole salers involved

in value addition. Results revealed that farmers' (land owners') profit was Rs.144/ maund. Grinder or wholesaler was getting profit of Rs.1100/ maund after deducting grinding costs. Whereas boiler agent (farmer cum boiler) earn huge profit of Rs.2492/ maund as compared to both the farmers and grinder agents. Higher profit at boiler level implies use of more energies and great risk involved during boiling and drying of turmeric under sun in the open fields.

**Table 5.** Cost of production analysis by farm size groups (Rs. acre$^{-1}$) (n=50)

| **Cost components** | **Farm size groups** | | **Average farm** | **% Share of TVC at average farm** |
|---|---|---|---|---|
| | **Small farm** | **Large farm** | | |
| Land preparation charges | 9618.05 | 11126.10 | 10276.00 | 12.32 |
| Costs of seed and sowing | 15233.87 | 14594.74 | 14991.00 | 17.97 |
| Cost of fertilizers (natural and synthetic) | 22974.19 | 25789.47 | 24044.00 | 28.82 |
| Water charges (tube-well irrigation cost + abiana rate**) | 22350.00 | 17808.69 | 20624.30 | 24.72 |
| Integrated pest management charges | 6638.72 | 6447.37 | 6326.32 | 7.58 |
| Harvesting charges | 7112.90 | 7236.84 | 7160.00 | 8.59 |
| Variable Costs | 83927.73 | 83003.21 | 83421.62 | 100 |
| Fixed Cost (land rent) | 32600.00 | 34764.70 | 33382.98 | - |
| Total Cost (variable + fixed) | 116527.7 | 117767.91 | 116804.6 | - |
| Yield of raw turmeric (Maunds/ acre) | 144.35 | 158.74 | 150.85 | **-** |
| Prices of raw turmeric (Rs./maund) | 685.16 | 706.05 | 696.85 | **-** |
| Gross Income (Yield * Price/Maund) | 98902.85 | 112078.38 | 105119.82 | - |
| Gross Margin (GI-VC) | 14975.12 | 29075.17 | 21698.2 | - |
| Net income (including land rent) | (-) 17624.88* | (-) 5689.53* | (-) 11684.8***** | - |
| Net income (excluding land rent) | 14975.12 | 29075.17 | 21698.2 | - |
| Benefit Cost Ratio (including land rent) | 0.85:1 | 0.95:1 | 0.90 : 1 | - |
| Benefit Cost Ratio (excluding land rent) | 1.18:1 | 1.35:1 | 1.26 : 1 | - |

Note: "n" represents sample size of respondents
Source: Field Survey (2014)
** Flat abiana rate of Rs.85 per cropped acre were used for kharif season's turmeric crop.
***** Negative net income results imply that all the farm size groups were in a huge loss situation.

**Table 6.** Value chains analysis

| Type of Agent | Yield (Maunds/ Acre) | Purchase price (Rs./ Maund) | Sale price (Rs./Maund) | Input costs (Rs./Maund) | Profit margin (Rs./ Maund) |
|---|---|---|---|---|---|
| Farmer (land owner) | 151 | - | 696 | 83421/151 =552 | 144 |
| Boiler (land owner cum boiler) | 151 / 4.34= 35 | 4.34*696 =2958 | 5600 | 150 | 35*5600 =(19600) Less = - 35*(2958+150)=108780 _____ =2492 |
| Grinder/ Wholesaler (machine holder) | 34 | 5600 | 7200 | 500 | 34*7200 =244800 Less = - 34*(5600+500) =207400 =37400/34 =1100 |

Source: Field Survey, 2014

N.B 1: Digits have been rounded off to the nearest whole values.

N.B 2: Analysis results are based upon very few numbers of processors. Detailed comprehensive analysis may be performed representing whole population. Sale price of raw turmeric as Rs.696 was prevailing at the time of cultivation whereas sale/ purchase prices during processing activities were prices prevailing during March-April. N.B 3: Yield/output shrinks at the ratio of 1 / 4.34 at boiler level (0.23 parts or quarter is retained). In this way, boiler gets 35 maunds from boiling and drying up the fresh turmeric in the sun. N.B 4: From 35 maunds of turmeric, grinder gets 34 maunds as one maund is lost during grinding activity.

**Table 7.** Feasibility analysis of turmeric grinding unit (here n=10)

| Items | Unit / Quantity details | Cost (Rs.) |
|---|---|---|
| **Grinding Unit Establishment Costs (Fixed costs)** | | |
| Turmeric Chakki (Size No.50) | One | 45000 |
| Double Zero Jaali | One | 200 |
| Frame along with Jaal | One | 2500 |
| Diesel Engine (30 HP) | One | 60000 |
| Cost of accessories (shaft, plates and pully etc.) | One set | 25000 |
| Furniture and fixture | Electricity works, one table, one fan and 5 chairs | 30000 |
| Fixed utility bills | Fixed monthly billing of water and electricity | 400 |
| Monthly rent of building | For 5 Marla space | 3500 |
| Payment of rent in advance | Equal to 6 months rented amount | 21000 |
| Unit Establishment Costs | - | 187600 |
| **Input / output analysis** | | |
| Purchased cost of dried Turmeric (Price Rs.5600/Maund) | Average cost is treated here | 5600 |
| Total grinding charges @ Rs.500/Maund | Inclusive of rent, electricity, water, diesel, one man labor and machinery maintenance costs etc. | 500 |
| Transportation/ Marketing costs (@ Rs.100/Maund * 60 Maunds) | Inclusive of packing material bags, packing labor and transportation costs of grinded turmeric | |
| Input Costs (Total Rs.) | | 6100 |
| Revenue from sale of one maund of grinded turmeric (@ Rs.7200/ Maund) | average peak season sale price of grinded turmeric | 7200 |
| Average Profit (Rs./Maund) | Revenue – Variable Input costs | 1100 |

Source: Field Survey (2014)

**Feasibility analysis of turmeric grinding unit**

During group discussions, it was discovered that there are only 3 to 5 grinding mills in the study villages. This number was not enough for grinding huge volume of turmeric in the area. Keeping in view the rising scope in value addition, economic feasibility of turmeric processing with ordinary turmeric grinding unit was also carried out (Table 7). Results showed that ordinary grinding unit may be installed with approximately Rs.187600. Further analysis on input-output costs based on prevailing rates in the market revealed that total cost from boiling to marketing of turmeric was Rs.6100 per maund which is three times higher as calculated by Baskaranin India (@ Rs.2000 per maund during comparable period of time i.e. Year 2012).

Keeping in view the prevalent sale price of powdered turmeric as Rs.7200 per maund, a net profit of Rs.1100 per maund was realized. Processors reported that a processor can grind and sale powdered turmeric up to 60 maunds in a month, thereby securing monthly profit of Rs.66000 (excluding due share of unit establishment costs). Although processing in the country is old traditional instruments based, yet results imply that opportunities exist for farmers/ local processors to add value to raw turmeric for enhanced incomes. According to Patil *et al.* (2009), human labor accounts for more than 44% of total processing costs, therefore, profit margin may further be improved if modern instruments of processing, which require less human labor are introduced in the country.

## CONCLUSION

Cultivation, processing and marketing aspects of turmeric in major turmeric growing belt i.e. district Kasur have been studied. Results reveal that turmeric growers were growing turmeric since many years and recently the local processors with small grinding units have also established in the study area transforming cultivation of turmeric to highly profitable commercial enterprise. However, leaf viral attack and rising pH of the turmeric soils were identified as major threats significantly affecting turmeric yield. If concerned scientists take these issues in their research plans then there are chances of increased production of turmeric in future. Frequently fluctuating prices, higher profit margins associate with processing and undue deductions in weight of raw turmeric by middlemen in local market were identified as major factors behind value addition of raw turmeric to powder form. As a policy option, government should revive advisory role of Agriculture Extension Department in promoting turmeric cultivation and processing on scientific lines. Moreover, government should regulate marketing system which would reduce price fluctuations and ensure remunerative shares to producer during peak seasons. Last but not least, private sector traders should also come ahead in extending flexible loans to local processors for installation of turmeric grinding units.

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