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Evaluation of Onion Crop Production, Management Techniques and Economic Status in Balochistan, Pakistan

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Abstract: A diagnostic survey was conducted to evaluate the importance, methodology of agronomic practices, agronomy irrigation, plant protection activities and economic status of onion (*Allium cepa* L.) in Balochistan, Pakistan. 180 onion respondents (growers/professionals) were interviewed through a formatted questionnaire at their doorsteps. Survey revealed that the crop plays an important role in the economy of the province and 100% respondents of the region cultivate the crop because of net return. At least 0.49 ha is under onion cultivation by each respondent. Maximum average area under onion cultivation and yield was reported from Kalat division (3.09 ha and 17758 kg ha⁻¹ respectively). In Kalat and Nasirabad divisions mostly young generation (<35 years) is engaged with agriculture farming. In Quetta and Zhob divisions the farmers are mostly between 36-50 years of age. Sibi and Makran have old farmers (, 50 years). Mostly Local and Sariab Surkh onion varieties are cultivated by broadcasted method with a range 12-16 kg ha⁻¹ seed rate. Fertilizer is applied in Kalat, Quetta and Nasirabad only while pesticides in Kalat, Quetta, Nasirabad and Zhob divisions. The crop is provided by 16-30 (minimum to maximum) irrigations. Irrigation water, thrips (*Thrips* spp.) attack and presence of weeds is the major reported problems of the crop in the province. Hand weeding for the eradication of weeds is used in all divisions. Best cost/benefit ratio (1: 4.⁴⁹) was calculated from Nasirabad and least (1: 2.⁶⁰) from Makran division.

Key words: Onion, thrips, karaz system of irrigation, Balochistan, Pakistan

Introduction

Onion is a monocotyledonous plant belongs to the family Amaryllidaceae (Malik, 1994) and is an important horticultural crop of Pakistan (Hassan and Malik, 2002). The crop has top rank among the production of condiment and spices in Balochistan and is cultivated over 20,047 ha. (Hassan and Malik, 2001a). About 20,000 kg ha⁻¹ is an average producing capacity of the region (Hassan and Malik, 2001b). Chaghi, Mastung, Kalat, Turbat, Killa Saifullah, Khuzdar, Nasirabad, Kharan. Quetta and Jaffarabad are the main onion producing districts of the province (Anonymous, 1998-99).

A number of factors include; seed quality, irrigation water (Hassan, 1984), soil condition, fertilizers (Syed *et al.*, 2000), cultivation methodology (Hassan and Malik, 2002 and 2001b), variety,

weeds (Hassan and Malik, 2002), insect pests/ diseases, marketing and even farmer's experience and enthusiasm play an important role in maximization of the crop yield and cost/benefit ratio.

Keeping in view, getting a complete picture of the crop, for onion management in Balochistan, a comprehensive survey through a prescribed questionnaire was designed for all the six divisions of the province of Balochistan.

Materials and Methods

The study regarding diagnostic survey was conducted through all the six divisions (Kalat, Quetta, Nasirabad, Zhob, Sibi and Makran) of the province of Balochistan, Pakistan, during 2001-2002. Questions regarding, respondent (grower/professional) name, father's name, address, literacy status, age, onion cultivation experience; area under cultivation of onion by the said respondent; cultivated variety of onion; Seed price and place of purchase; seed rate; sowing methodology (broadcasted or transplanted) and date; type, number and time interval of irrigation; fertilizer used; weeds, insect pest and diseases of the crop and their management; harvesting date; produce ha^{-1} ; Marketing; cost of land preparation, fertilizers, pesticides, irrigation, harvesting, weeding, miscellaneous (includes transportation from farm to market and land rent etc.) and problems relating to the onion cultivation were asked through questionnaire, designed in national language Urdu. The respondents ($n=30$) were divided into three age groups ($A \leq 35$; $B=36-50$; $C > 50$). Most of the farmers are illiterate in Balochistan (Shah *et al.*, 2002). In the north farmers are Pashtoon speak Pashto while in the south either Baloch or Berahvi speaks Balochi, Berahvi or Sindhi. A local translator was arranged for those respondents who could not understand Urdu. 180 respondents (30 from each division) were visited at their door steps randomly.

Results and Discussion

Table 1a and b depict the respondent age group, percentage number of respondents in particular age group, respondent's onion cultivation experience range (minimum and maximum), percentage literacy rate of the respondent, average onion cultivated area (hectares) by the respondent and average yield (kg ha^{-1}) obtained by the respected respondent age group. Most of the respondents in Kalat and Nasirabad were ≤ 35 (47% each), Quetta and Zhob between 36-50 (40 and 47% respectively) while in Sibi and Makran divisions > 50 years (43 and 53% respectively). Farming trend, among the young people of Quetta, Zhob, Sibi and Makran divisions, is declining while the literacy rate is encouraging. Highest literacy rate was observed in Quetta divisions (47%) while Nasirabad and Makran showed minimum (about 13% each). Within age group the respondents ≤ 35 years are most literate. Farmers of Makran division are the most experienced in onion cultivation. Indirect relation was found between age, onion cultivated area and yield. Kalat division has maximum area and yield of onion in the province (3.09 ha and 17758 kg ha^{-1} respectively). Sibi has minimum cultivated area (0.69 ha) and Makran division has minimum yield (10000 kg ha^{-1}) in Balochistan.

Table 2 reveals the cultivated varieties, purchasing place of onion seed, seed price range (minimum and maximum), sowing method, % number of respondents use fertilizer, seed rate range

Table 1a: Relation between respondent's ages, onion cultivation experience, literacy rate, onion cultivated area and onion yield in Kalat, Quetta and Nasirabad divisions of Balochistan, Pakistan

¹ AG	Kalat					Quetta					Nasirabad				
	² %	³ EXP	⁴ LR	⁵ CA	⁶ Y	%	EXP	LR	CA	Y	%	EXP	LR	CA	Y
A	47	05-15	50	4.06	21464	27	06-10	100	3.54	17562	47	10-20	21	1.76	14857
B	30	15-35	22	2.55	15278	40	18-30	50	2.61	14367	43	10-30	08	1.68	12384
C	23	25-40	00	1.85	13539	33	20-40	00	1.49	12200	10	30-35	00	0.81	9666
Average (n=30)	- - - - -	30	3.09	17758	--	- - -	47	2.48	14500	--	- - -	13	1.63	13266	

¹AG = Age Groups (years): A= ≤35 (Kalat n=14, Quetta n=08 & Nasirabad n=14); B=36-50 (Kalat n=09, Quetta n= 12 & Nasirabad n= 13); C=>50 (Kalat n=7, Quetta n=10 & Nasirabad n=03)

²% = Average percentage number of individuals in that particular age group

³EXP = Onion cultivation experience (years) range (minimum and maximum)

⁴LR = % literacy rate among the respondent age group

⁵CA = Average cultivated area (hectares) by the respondents of particular age group

⁶Y = Average yield (Kg ha⁻¹) obtained by respondents of the respected age group

Table 1b: Relation between respondent's ages, onion cultivation experience, literacy rate, onion cultivated area and onion yield in Zhob, Sibi and Makran divisions of Balochistan, Pakistan

¹ AG	Zhob					Sibi					Makran				
	² %	³ EXP	⁴ LR	⁵ CA	⁶ Y	%	EXP	LR	CA	Y	%	EXP	LR	CA	Y
A	40	02-10	58	2.12	14041	27	05-15	62	1.16	13375	17	08-20	40	3.64	13400
B	47	10-30	14	1.14	12000	30	20-40	00	0.54	11778	30	10-20	22	2.87	11833
C	13	30-35	00	0.91	9875	43	20-40	00	0.49	9308	53	25-50	00	1.46	7906
Average (n=30)	- - - - -	30	1.55	12533	--	- - -	17	0.69	11133	--	- - -	13	2.25	10000	

¹AG = Age Groups (years): A= ≤35 (Zhob n=12, Sibi n=08 & Makran n=05); B=36-50 (Zhob n=14, Sibi n=09 & Makran n=09); C=>50 (Zhob n=04, Sibi n=13 & Makran n=16)

²% = Average percentage number of individuals in that particular age group

³EXP = Onion cultivation experience (years) range (minimum and maximum)

⁴LR = percentage literacy rate among the respondent age group

⁵CA = Average cultivated area (hectares) by the respondents of particular age group

⁶Y = Average yield (Kg ha⁻¹) obtained by respondents of the respected age group

(minimum and maximum), sowing and harvesting months range of the crop observed by the respondents of all six divisions of Balochistan. Local and Sariab Surkh are the famous cultivated varieties in the province. White Globe and Phulkara are cultivated only in Quetta and Nasirabad divisions respectively. Chiltan-89 is recommended for sub-tropical regions thus are grown by a few farmers in Kalat, Quetta and Zhob divisions. 100 percent farmers obtain onion seed from the local markets. Department of Agriculture could play an important role in the provision of certified onion seeds to the farmers. This might have a positive impact on the yield of the crop. Farmers are spending rupees 600-850 in purchasing one Kg onion seed. Involvement of the government might play an important role in the price control of the onion seed. Onion is grown either by broadcasted way, which is easier (Hassan and Malik, 2002) or by transplanted which results in good yield (Hassan and Malik, 2001b). 100% respondent of Kalat, Quetta, Zhob and Makran divisions cultivate onion by broadcasted method. In Nasirabad and Sibi both sowing

Table 2: Various agronomic practices of onion crop adopted by the respondents of all six divisions of Balochistan, Pakistan

Cultivation Parameters	Divisions of Balochistan province, PAKISTAN					
	Kalat	Quetta	Nasirabad	Zhob	Sibi	Makran
¹ Variety 1	60.00	53.33	16.66	06.66	---	06.66
ariety 2	23.33	26.66	33.33	50.00	100.0	93.33
Variety 3	16.66	06.66	---	43.00	---	---
Variety 4	---	13.33	---	---	---	---
Variety 5	---	---	50.00	---	---	---
Seed Purchasing Place	Market	Market	Market	Market	Market	Market
² SP	600-650	600-650	600-700	700-750	700-850	650-700
³ SM	100/B	100/B	33/B, 67/T	100/B	97/B, 3/T	100/B
⁴ FER	100	100	16.66	---	---	---
Seed Rate Range, Kg ha ⁻¹ (minimum and maximum)	12-14	14-16	04-06/T;14-15/B	13-14	05/T;13-15/B	13-15
⁵ ST	Feb-Mar	Feb-Mar	Nov-Dec	Feb-Apl	Oct-Dec	Feb-Mar
⁶ HT	Aug-Sep	Aug-Sep	May-June	Aug-Sep	May-Apl	Aug-Sep

¹V = Varieties (percentage adaptation by the respondents): V1=Sariab Red, V2=Local Strain, V3=Chiltan-89, V4=White Strain, V5=Phulkara)

²SP = Seed Price Range (minimum and maximum), Pakistani Rupees Kg⁻¹

³SM = Sowing Method (percentage adaptation by the respondents): B=Broadcasted, T=Transplanted

⁴FER = % Number of respondents, use fertilizer

⁵ST = Swing Time Months Range (Feb=February, Mar=March, Apl=April, Oct=October, Nov=November, Dec=December)

⁶HT = Harvesting/Digging Time Months Range (Apl=April, Aug=August, Sep=September)

Table 3: Various irrigation and plant protection activities adopted by the respondents in all six divisions of Balochistan, Pakistan

Divisions	² Irrigation type						³ PESTS		⁴ Pest control	⁶ Weeds control	
	¹ IRRI No.	TW	Karaz	Canal	E/M	Stream	Thrips	Disease		⁵ Weeds	control
Kalat	28-30	100.0	---	---	--	---	100.0	40.00	53.33	100.0	100.0
Quetta	28-30	100.0	---	---	--	---	100.0	03.33	46.66	100.0	100.0
Nasiraba	17-18	20.00	---	66.66	--	13.33	53.33	03.33	16.66	10.00	10.00
Zhob	18-20	93.33	06.66	---	--	---	73.33	---	16.66	70.00	70.00
Sibi	18-20	26.66	---	30.00	10	33.33	83.33	16.66	---	90.00	90.00
Makran	16-18	56.66	43.33	---	--	---	73.33	---	---	03.33	03.33

¹ = Irrigation Number Range (Minimum and maximum)

² = Irrigation type (% adaptation by the respondents): TW=tube-well, E/M=electric motor

³ = % Number of Respondents, Reported Pest and Diseases in Onion

⁴ = % Number of Respondents, Adopted Pest Control for Pest and Diseases in Onion

⁵ = % Number of Respondents, Reported Weeds in Their Fields

⁶ = % Number of Respondents, Adopted Weeds Control (Hand Weeding)

methods are reported (33, 67 and 97, 3% broadcasted/transplanted respectively). Pre-sowing fertilizer is applied in Kalat, Quetta and Nasirabad divisions only. 12-15 Kg ha⁻¹ onion seed is being practiced for broadcasting and 4-6 for transplanting in the province. 10 - 12 and 5 - 6 Kg ha⁻¹ seeds are recommended by the Department of Agriculture (extension), Balochistan for broadcasting and transplanting respectively (Anonymous, 2002). In the Sub-tropical, temperate

Table 4: Average cultivation expenditure and cost/benefit ratio of a hectare of onion crop in all six divisions of Balochistan, Pakistan

Inputs	Per hectare cost in divisions of Balochistan					
	Kalat	Quetta	Nasirabad	Zhob	Sibi	Makran
Land Preparation Cost	1278	1203	967	1315	760	1253
Seed and Seed Spreading Cost	10100	10253	6258	11150	11500	13050
Fertilizer Cost	6600	4967	700	- - -	- - -	- - -
Plant Protection Cost	640	613	163	167	- - -	- - -
Irrigation Cost	8017	8125	7223	8427	6465	6635
Hand Weeding Cost	6605	5450	100	2917	1533	- - -
Harvesting (Digging)/Packing Cost	9883	10317	5650	9770	3000	8817
¹ Misc.	5000	5000	5000	5000	3000	4000
Total Investment (Pakistani Rupees, Pak. Rs.)	48123	45928	26061	38746	26258	33755
Markup @ 14% on Total Investment	6737	6430	3649	5424	3676	4726
Average Total Cost (Pak. Rs.)	54860	52358	29710	44170	29934	38481
Average Production (Kg ha ⁻¹)	17758	14500	13267	12533	11133	10000
Average Cost of Production (Rs. Kg ⁻¹)	3.09	3.61	2.24	3.52	2.69	3.85
Average Maximum Retail Price ((Rs. Kg ⁻¹)	12.20	10.13	10.06	9.83	10.13	10.00
Average Cost/Benefit Ratio	1: 3. ⁹⁵	1: 2. ⁸⁰	1: 4. ⁴⁹	1: 2. ⁷⁹	1: 3. ⁷⁶	1: 2. ⁶⁰

¹Misc = Miscellaneous; Includes Transportation Charges from Farm to Market, Land Rent etc

divisions (Quetta, Zhob, Kalat and Makran) the crop is sown between February and April while in the tropical (Sibi and Nasirabad divisions) during October to December. The crop is dig out between August to September and May to June in Subtropical and tropical areas respectively.

Table 3 reveals the type and irrigation number range (minimum and maximum), pest, weeds and their control in onion. In Kalat and Quetta maximum numbers of irrigations (30) are provided to the crop. 16 are the minimum irrigations applied in Makran. 25-40 irrigations are the recommended for onion crop in Balochistan (Anonymous, 1997). Mostly tube-well are used for irrigation. Thrips is the major insect pest attack to the crop. 100% respondents of Kalat and Quetta reported the damage of this pest. 83.33, 73.33, 73.33 and 53.33% respondents reported the presence of the pest in Sibi, Zhob, Makran and Nasirabad divisions respectively. Mostly Monocrotophos and Methamidophos pesticides are used for the control of thrips in the regions. Kalat, Quetta, Nasirabad and Sibi divisions also reported Root Rot of onion. 53.33, 46.66, 16.66 and 16.66% respondents of Kalat, Quetta, Nasirabad and Zhob use pesticides while no control measure is in practice in other divisions. Weeds are reported as main problem from all over the province. Maximum of 100% (Kalat, Quetta divisions) and minimum of 3.33% (Makran division) respondents reported weeds presence in their fields. All the respondents have hand-weeding practice to eradicate the weeds.

Table 4 depicts average expenditure and cost/benefit ratio of onion in all six divisions of Balochistan. Maximum capital is spent on purchase and spreading of seed (Pakistani Rupees, Pak. Rs. 6258 to 13050) followed by onion harvesting/digging and packing (Pak. Rs. 3000 to 10317) and irrigation (Pak. Rs. 6465 to 8427). Hand weeding is another expensive input and up to Pak. Rs. 6605 is spent on this in the province of Balochistan. Mostly the farmers are poor and took loan

for all the input capital thus 14% markup is added in the total investment on the crop. A minimum of 2.24 (Nasirabad division) and maximum of 3.85 Pak. Rs. Kg⁻¹ (Makran division) average cost of production is calculated. The Best average cost/benefit ratio was obtained in Nasirabad (1: 4.⁴⁹) and least in Makran division (1: 2.⁶⁰). Though cost/benefit ratio is not attractive but out of season (April-July and October-December) onion may be sold on an average price of about > 9 Rs. Kg⁻¹ in Balochistan with an average of 1: 3 cost/benefit ratios (Anonymous, 1998-99).

The above discussion reveals that onion is a good crop to cultivate in Balochistan. Kalat and Quetta are the two main divisions of the province for the production of onion. In Balochistan except Sibi and Makran divisions the future of agriculture is bright because most of the farmers are young and energetic (Table 1a and b). Sibi is the hottest place of Pakistan where the mean temperature reaches up to 46°C (Anonymous, 1998-99). Mostly the manpower migrates to other places except a few landlords, which is resulting agricultural decline. Makran is on the coastal rim of Balochistan. Fish industry is the main stay in this division. A few old people are engaged with agriculture, which are not being replaced by the young generation. For the betterment of agriculture young skill with hot enthusiasm in the field is a dire need. Onion crop needs a lot of water. The shortage of water is getting worst day by day (Shah *et al.*, 2002). Water management is very necessary to avoid this shortage. Availability of quality seeds on control rate is another problem in the province. It is observed that most of the respondents were using more seed than recommended rates, 4 kg for transplant and 8-10 kg ha⁻¹ for broadcast methods respectively (Anonymous, 2002), thus the average cost/benefit ratio is affected. Thrips are the main insect problem. In Sibi and Makran divisions no plant protection activity is observed while the use of fertilizer is limited to the Kalat, Quetta and Nasirabad divisions only. Production could be increased by applying pesticides and fertilizers, as is proved by the Kalat and Quetta divisions (Table 1a and b). Weeds are reported from almost all the divisions. The problem could minimize by using weedicide (Hassan and Malik, 2001a) and by obtaining certified seeds. Mostly the farmers of Balochistan follow broadcasted method of onion cultivation to avoid extra labor. More yields could be obtained by transplanting onion. Hassan and Malik (2001a; 2002), reported 39700 and 29500 kg ha⁻¹ onion yield by transplanting and broadcasting methods respectively. Thus transplanted method of onion cultivation is recommended. To increase yield and average cost/benefit ratio of onion, 5 and 10 kg ha⁻¹ seed must be used for transplanted and broadcasted methods respectively. 18-25 irrigation are enough for a good crop. Fertilizer (N: P: K @ 120:80:80 Kg ha⁻¹ and Organo-Phosphate pesticides for the control of thrips (Anonymous, 1997).

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