POTENTIAL ASSESSMENT OF CROPPING BELTS OF IRRIGATED PUNJAB FOR LIVESTOCK PRODUCTION THROUGH AGRO-GRAZING

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ABSTRACT: This study was undertaken during 2007-2008- Five cropping belts (ecological regions) viz., 1. Hot arid semi desert sandy belt. 2. Hot arid semi-desert clayey/loamy belt. 3. Cotton belt. 4. Mixed cropping belt 5. Rice belt were investigated for their potential of livestock production through agro-grazing. Rice cropping belt had maximum whereas Hot arid semi-desert sandy belt minimum potential for livestock production through agro-grazing. Rice cropping belt had maximum wealth of agro-grazed animals (513310 A.U), animal intensity (393.3 A. U/1000 ha), size of herds (55 A. U/herd) and percentage of buffaloes (64.4) despite of having 3rd position by extent of area. On the other hand Hot arid semi-desert sandy belt enjoyed 2nd position by area, even then it showed the minimum animal intensity (129.4 A. U/1000 ha), herd size (34.5 A. U/herd) and number of buffaloes (42.1%). After Rice cropping belts, Mixed and Cotton cropping belts showed 3rd and 4th position with respect to potential for livestock production through agro-grazing.

INTRODUCTION

The importance of livestock can be realized from the facts that this sector is contributing 49.6% of agricultural GDP (Govt. of Pakistan 2008). About 30-35 million people were engaged with this and got 30-40% of their income from livestock (Govt. of Pakistan 2007). Moreover livestock accounted 12.0% of national GDP (Govt. of Pakistan 2006). The traction power of total livestock of the country was reported as equal to 3 lac tractors (Ali, 2005). One tone of farm yard manure consisting animal dung, urine and refused feed contain 4.5 Kg N, 0.8 Kg P, 3.0 Kg K and 230 Kg organic matter (Khan, 1994). The present livestock population has jumped to 143 million from 110 million heads since previous livestock census in 1996. Whereas availability of green fodder is only 0.74 tones/head/year (Govt. of Pakistan, 2008). According to another report, gap between demand and supply of green forage increased alarmingly from 975 to 1099.4 million tones during five years i.e. (1995/96 to 1999/2000) (Khan *et al.*, 2003). The acute shortage of forage was also pointed out by Hanjra (1994) and Sarwar *et al.* (2002). It was highlighted by Govt. of Pakistan that the extent of area under fodder production is decreasing and during previous two decades the decrease in fodder had been 11.6% (Govt. of Pakistan, 2006). Another important resource for livestock is rangelands. But the productivity of rangeland has decreased up to 50 percent due to heavy exploitation of this important resource through overstocking, heavy grazing, excessive lopping and cutting of trees and shrubs for animal feeding and burning as fuel. About 60-70% feeding requirements of sheep and goat are met from rangelands. Against carrying capacity of 4.5 million animal units, rangeland is being grazed by 12.0 million animal units (Quraishi *et al.*, 1993, 1994).

This situation has led acute shortage of green forage in the country as pointed out by a certain number of workers (Bhatti *et al.*, 1989; Quraishi *et al.*, 1993, Hanjra 1994, Sarwar *et al.*, 2002; Khan *et al.*, 2003; Ali 2005, Waheed *et al.*, 2007; Anonymous, 2008 and Govt. of Pakistan, 2008).

Agro-grazing means grazing in the agro-ecozones by mobile herds on naturnal vegetation growing place to place i.e. along rivers, canals, streams, water channels, road sides, along railway tracks, in the village wasteland, on crop residues in the farmers fields after crop harvest etc. Agro-grazing is cheapest source of livestock production and is the best substitute of green fodder for livestock in Pakistan. The animals utilize weeds of the fields which may compete with farm crops and convert into valuable livestock products and on the other hand add nutrients in the field in the form of urine and dung which increase the fertility of the field. The insect pest harbouring on weeds are destroyed and the risk of attacking insect pests on agricultural crops is minimized (Muhammad *et al.*,

2007). About 23% of total wealth of livestock depends upon agro-grazing in Pakistan.

Keeping in view high potential of agro-grazing for livestock production, the present study was designed and undertaken in various districts by dividing irrigated Punjab into 5 ecological regions (cropping belts) to see their contribution (role) toward livestock production by agro-grazing.

MATERIALS AND METHODS

The study was undertaken only in those 30 districts of Punjab where the crop fields were irrigated by canal or tube well water and the study was confined upto those areas where minimal animal grazing and intensive crop farming were overlapping each other to varying degrees at one time. The ecological division representing different cropping belts of irrigated Punjab proposed by Pakistan Agricultural Research Council (PARC) was adopted with minor modifications for the purpose of this research (PARC, 1980), which is given as under along with civil districts and number of villages (Table 1).

Table 1: Ecological regions along with districts in irrigated Punjab

S. #	Ecological regions/ cropping belts	Civil Districts	Villages	
			#	%
I	Hot arid semi-desert sandy belt (predominately, cotton, chick pea, cluster bean and wheat belt.	Bahawalpur, Bakkar, D. G. Khan, Layyah, Muzafar Garh, Rahim Yar Khan and Rajanpur	1635	12.5
II.	Hot arid semi-desert clayey/ loamy belt (predominately, sorghum, pulses, millet and wheat belt)	Jhang, Khushab, Mianwali and Sargodha	2123	16.3
III.	Cotton belt (Cotton, wheat and sugarcane etc.)	Bahawalnagar, Khanewal, Lodhran, Multan, Pakpattan, Sahiwal and Vehari	3490	26.7
IV.	Mixed cropping belt (Sugarcane,, corn, fodders and wheat belt)	Faisalabad, Okara and Toba Tek Singh	1879	14.4
V.	Rice belt (Rice and wheat etc.)	Gujranwala, Gujrat, Hafizabad, Kasur, Lahore, Mandi Bahauddin, Narowal, Sheikhupura and Sialkot	3931	30.1
	TOTAL		**13058**	**100**

These above referred agro-eco-zones/cropping belt, were sampled through stratified Random Sampling Design as described by Cochran (1977) and studied to assess their contribution in livestock production through agro-grazing. A self-explanatory questionnaire was developed for agro-graziers to collect the required information and facts. Only those agro-graziers in irrigated tracts of Punjab were interviewed who mostly depended upon grazing animals as their major source of livelihood tending a herd consisting 15 or more animal units. A proportionate number of agro-graziers in each ecological region were interviewed (Table 2). The agro-graziers as well as their locations (villages) were selected randomly. Thus 360 graziers from 5 ecological regions were interviewed in total (Table 2). The data thus collected was transferred to tally-sheets, tabulated and averaged as suggested by Steel & Torrie (1994) for results and interpretation.

Table 2: Number of agro-graziers (respondents) interviewed in different grazing sites of ecological regions (cropping belts) in Irrigated Punjab

No.	Ecological regions/ cropping belts	Respondents interviewed in grazing sites.						
		Along streams/ rivers	Along rail tracks/ roads	Along major canals/ drains	Around forest/ range areas/ along international border	Around cities	In the Interior	Total
I.	Hot arid semi-desert sandy belt*	6	12	7	7	3	10	45
II.	Hot arid semi-desert clayey/ loamy belt**	6	21	10	4	3	15	59
III.	Cotton belt	7	35	25	2	5	22	96
IV.	Mixed cropping belt***	2	21	13	1	2	13	52
V.	Rice belt	9	39	19	5	5	31	108
	Total	30	128	74	19	18	91	360

* (Predominately, cotton, chick pea, cluster bean and wheat belt). ** (Predominately, sorghum, pulses, millet and wheat belt). *** (Predominately, sugarcane, corn, fodders and wheat belt).

RESULTS AND DISCUSSION

Punjab is very famous for its crop production through out the world. Livestock production is an integral part of agriculture. Crop farming always promotes agro-grazing for livestock production. Different cropping belts based on ecological zones of irrigated Punjab were investigated for their potential for livestock production through agro-grazing. The results are presented in the table 3 given as under.

Total cropped area of irrigated Punjab investigated and assessed for potential for livestock production through agro-grazing was 6289000 ha. Cotton and Mixed cropping belt embraced maximum (2379000 ha, 37.8%) and minimum (601000 ha, 9.6%) area respectively. Whereas there were no significant difference between the area covered by Hot arid semi desert sandy cropping belt (1344000 ha, 21.4%), Rice cropping belt (1305000 ha, 20.7%) and between Hot arid semi desert clayey loamy and Mixed cropping belts which were extended to 10.5 and 9.6 percentage of the total cropping area. The cultivated area in general and area under fodder crops in particular was drastically decreasing due to colonization, establishment of industrial units, construction of various infrastructures, Quraishi *et al.* (1993, 1994). The grazing area in intensive crop production had also shrunk due to encroachment of cultivation (Sarwar *et al.*, 2002; Govt. of Pakistan, 2008; Manidool and Chanktan, 1987).

Maximum number (513310 A. U.) and percentage (36.3) of agro-grazing animals were found in Rice cropping belt which may be placed on 3rd position by area. But it was not true for mixed cropping belt as minimum number (153064 A. U.) and percentage (10.8) of animals recorded in this cropping belt was corresponding to the area of the cropping belt because Mixed cropping belt occupied the lowest 5th position with respect to area and population of agro-grazing animals.

On overall bases, buffaloes (48.9%) and cattle (31.9%) were the prominent, whereas goats

Table 3: Agro-grazed livestock potential in various cropping belts of irrigated Punjab

Livestock Production oriented characters per cropping belt	Cropping belts					
	HASDSB*	HASDCLB**	Cotton belt	Mixed cropping belt	Rice belt	Total
Total cropping area of cropping belt (acres).	1344000	660000	2379000	601000	1305000	6289000
Area percentage of cropping belt.	21.4	10.5	37.8	9.6	20.7	100
No. of A.U. per cropping belt.	173909	208740	365232	153064	513310	1414255
Percentage of A. U. per cropping belt.	12.3	14.8	25.8	10.8	36.3	100
A. U. per herd per cropping belt.	34.5	36.0	38.7	37.2	55.0	
Percentage of cattle per cropping belt.	33.6	32.9	33.4	29.5	29.9	31.9
Percentage of buffaloes per cropping belt.	42.1	45.5	46.0	46.6	64.4	48.9
Percentage of sheep per cropping belt.	10.7	08.9	07.5	08.7	02.7	07.7
Percentage of goats per cropping belt.	13.6	12.6	13.1	15.3	03.0	11.5
Animal intensity (A.U./1000 ha) per cropping belt.	129.4	316.3	153.5	254.7	393.3	224.8

HASDSB*= Hot arid semi desert sandy belt; HASDCLB**= Hot arid semi-desert clayey loamy belt.

(11.5%) and sheep (7.7%) were non prominent kinds of agro-grazing animals in the study area. Maximum number of buffaloes (64.4%) and goats (15.3%) were found in Rice and Mixed cropping belts respectively, whereas cattle (33.6%) and sheep (10.7) were found on the top list of their respective kind in Hot arid semi desert sandy cropping belt. On the other hand minimum number of buffaloes (42.1%), cattle (29.5%) were recorded in Hot arid semi desert sandy and Mixed cropping belts respectively. Rice cropping belt showed the least number of sheep (2.7%) and goats (3.0%) respectively. This variation indicated that results were different between Hot arid sandy and Rice cropping belts. It was observed during survey of the rice cropping belt that majority of the agro-graziers were keeping buffaloes and cattle herds. Firstly the major reason of variable population of different kinds of agro-grazing animals in different cropping belts was ecological i.e. climate, nature & quantity of available feed. Secondly the agro-graziers of rice cropping belt were more commercialized in their business as compared to other cropping belts. They met their feed requirements by buying or growing their own fodder along with agro-grazing, using concentrated rations rice husks and rice straw during winter and lactation periods for maximizing their income. Thirdly, this cropping belt was under intensive rice farming where rice plants being shade intolerant demanded shade free environment resulted in scarcity of browse trees and shrubs.

The minimum number of sheep and goats in Rice cropping belt was due to this said reason. The results agree with the findings of Khan *et al.* (2003). Maximum and minimum number of large and small ruminants in this cropping belt was mainly due to increased profitability of larger animals.

Maximum (393.3 A. U/1000 ha) and minimum (129.4 A.U/1000 ha) intensity of agro-grazing animas was found in Rice and Hot arid semi desert sandy cropping belt respectively. Hot arid semi desert clayey/loamy, Mixed and Cotton cropping belts attained 2nd, 3rd and 4th position with respect to animal intensity by showing 316.3, 254.7 and 153.5 A. U/1000 ha in order. This variation of animal intensity is due to favourable climate environment for grazing in Rice cropping belt which ensured increased forage availability throughout the year as compared to Hot arid semi desert sandy cropping belt where meager forage availability and harsh grazing environment were due to vast desert area. The low carrying capacity of Hot arid semi desert sandy belt was also reported by Quraishi *et al.* (1993, 1994).

Manidool and Chantkan (1987) further stated that grass land area located in intensive crop zone had also shrunk due to extension of cultivation. The reason for lower percentage of agro-grazing animals in hot arid semi desert sandy cropping belt as well as in hot arid semi desert clayey/loamy cropping belt may be saught by the fact that about 35.2% of these cropping belts is lying as vast waste land (Govt. of Pakistan, 1996) and is not being used for agro-grazing livestock production.

Agro-grazing is the cheapest way of livestock production and has a great potential. But unfortunately it was ignored by the researchers and administrators alike in the past. It is strongly recommended that it should be promoted on scientific lines in future in order to meet the livestock and their product requirement of the nation.

CONCLUSION

From the above discussion, it can safely be concluded that Rice cropping belt, despite of having less area as compared to other cropping belts, gained the top position and showed maximum potential for livestock production through agro-grazing. Number of agro-grazed animals (513310 A. U.), animal intensity (393.3 A.U/1000 ha), size of herds (55 A.U/herd) were maximum.

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