

AN EMPIRICAL STUDY OF ECONOMICS OF
SUGARCANE CULTIVATION AND PROCESSING BASED
FARMING IN UTTAR PRADESH

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Abstract-

Sugarcane is one of the major cash crop of India and most important crop of Uttar Pradesh, which not only support the economy of Uttar Pradesh but also the major crop which is the source of income of millions of farmers, whether marginal, small, medium or large. In the present study, an attempt has been made to analyze the economics of sugarcane based farming system i.e. sugarcane cultivation by all the categories of farmers, cost benefit ratio from sugarcane cultivation, major products of sugarcane and their economy etc. This study has been done for Uttar Pradesh and four districts have been selected for a parallel study but the detail study has been done in Bulandshahr District through primary observation.

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INTRODUCTION

The sugarcane industry in India plays a vital role toward socio-economic development in the rural areas by mobilizing rural resources and generating higher income and employment opportunities.

Sugarcane cultivation is done around 4 million hectares of land in India and its production has fluctuated between 230-300 million tons in past several years. The sugar industry of Rs. 250 billion has about 450 sugar mills in India with an average installed capacity of 18 million tones. India is the largest consumer of sugar and second largest producer in the world. 90 percent of total sugarcane and sugar production in the country is with Maharashtra and Uttar Pradesh alone, accounting for 60 percent of India's total production. As against an average annual rise of 2.5 percent in world during the past ten years, global sugar consumption has grown by about 2 percent per annum, while in India the consumption has been higher at about 3.5 percent per annum (LKP Research). Uttar Pradesh is the largest sugarcane producing state in the country. It contributes 44 percent to the country's total sugarcane production and is also the largest producer of sugar in the country (Dwivedi, 2010).

The annual food grain production has increased from 51 million tons in early fifties to 206 million tons at the turn of the century. However, the input cost and output price gap increased, especially for food grains production due to removal of subsidies from agricultural input. Economic viability of such crops is in a weak position and the farmers are enthusiastic to shift the land use pattern from traditional subsistence food grain crops to market oriented value added crops, and so it has been moving up gradually (New Agricultural Policy 2007). Like the other value added crops, sugarcane is also more attractive crop for MNCs to invest their capital (Tiwari 2003; Isvarmurti 2007).

Sugarcane is an important cash crop in Uttar Pradesh. It has dominated in the farming system of many districts of Uttar Pradesh for a long time. Therefore, to explore the possibilities of raising farm production and farm income of this state, there is a need to understand sugarcane based farming system and their economics. The present study was undertaken in the three selected districts of Uttar Pradesh to trace the movement of sugarcane crop from the farm to the factory as also to jaggery/khandisari production unit to the consumer.

In this paper an attempt has been made to analyze to understanding the nature of production conditions, highlighting demand-supply mismatches, studying marketing and other related aspects of sugarcane, sugar, jaggery and khandisari, including their price behavior.

Key Words- Gur/ Jaggery, Khandsari, Cost –Return Analysis, Efficiency Management, Profitability Ratio, Planted and Ratoon Sugarcane.

OBJECTIVES

The present study was undertaken with the overall objectives of studying area, production, marketing and other related aspects of sugarcane, sugar, jiggery and khandsari including their price behavior. The specific objectives of the study are:

- To study changes in area, production, productivity and prices of sugarcane as also changes in production prices of sugar and jiggery, domestically and globally.
- To estimate the costs and returns from production of sugarcane, jiggery, sugar, khandsari and analyze the profitability of production of these items.
- To study the existing system of marketing of sugarcane, jaggery, khandsari and sugar.
- To study constraints faced by sugarcane growers, jaggery producers, khandsari producers and sugar producers in production and marketing of sugarcane, jaggery, khandsari and sugar and suggest possible ways of evolving an efficient supply chain for sugarcane.

NEED FOR THE STUDY

The sugar industry in Uttar Pradesh finds itself entangled in a complex web of problems leading to declining profitability to cane growers as well as sugar industries. The reason for the same are to be traced and suitability addressed to give a boost to this sector in the country. Here sugarcane is the only source of sugar in the state therefore, any mismatch between demand and supply of sugar in the state assumes significant at the national level and influences the economics of sugarcane cultivation to a great extent. The initiatives by the state government in the form of fixing a remunerative sugarcane price on the one end and pressurizing sugar mills to make payments within a reasonable time on the other end encouraged farmers to put in more area under the sugarcane crop. This underlines the need to study the economics of sugarcane in order to understand the effectiveness of the price policy in determining the area under sugarcane crop.

DATA BASE AND METHODOLOGY

For the present study the data has been collected from both the primary as well as secondary sources. Four major sugarcane producing districts, two from western Uttar Pradesh and two from Eastern Uttar Pradesh, have been selected from the whole state but the detail study has been done in district Bulandshahr. For the primary survey district Bulandshahr has been selected and ten villages dominating the sugarcane cultivations and jaggery production has been selected. The sugarcane producing households of marginal (> 1 hectare), small (1-2 hectares), medium (2 -4 hectares) and large (< 4 hectares) groups were selected randomly for survey. In total 85 farmers, in sugarcane farmers, the number small and medium farmers were large. So for survey 30 small farmers and 25 medium farmers, fifteen marginal and ten small farmers were selected. The preference was given to the sugarcane cultivator and Gur/ Jaggery producers. The secondary data is collected from the district statistical handbook, co-operative sugar volume of Uttar Pradesh and National Federation of Co-operative Sugar Factories Ltd, New Delhi. Here for the study simple percentage method has been applied.

The profit margin of Gur/ Jaggery manufacturing units has been calculated through:

$$r = \frac{TR - TC}{TR}$$

$$r = \frac{(\text{Price of X quantity}) - TC}{\text{Price of X quantity}}$$

Where 'r' = Profit

TR = Total Revenue (Sale)

TC = Total cost

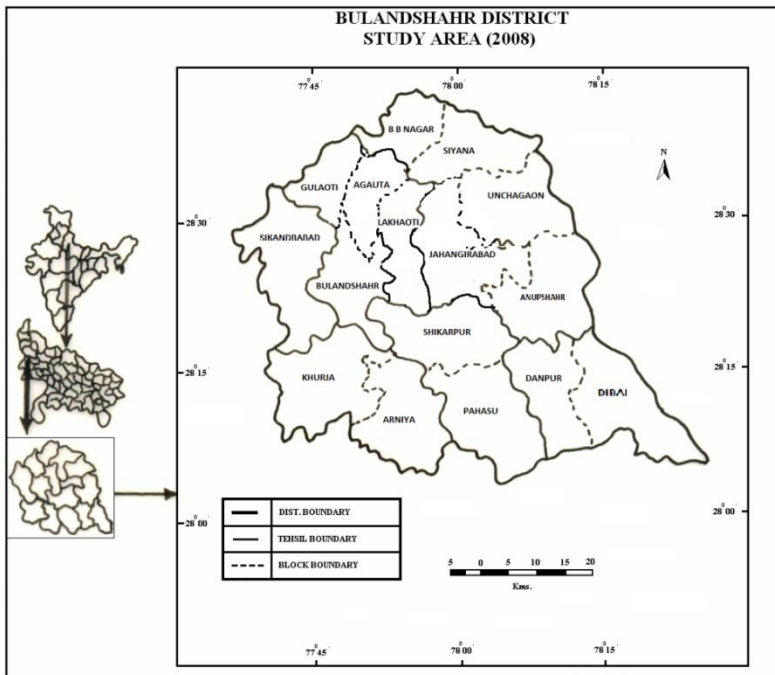
Similarly, for the calculation changes of Area, production and Yield has been calculated by Compound Growth Rate:

$$\text{CAGAR} = \left[\frac{\text{Ending Value}}{\text{Beginning Value}} \right]^{\frac{1}{\text{Number of Years}}} - 1$$

STUDY AREA

Bulandshahr, one of the important district of western Uttar Pradesh, lies between 28°4' to 28° 12' north latitude and between 77° 0' to 78° 0' east longitude and located in upper Ganga –Yamuna Doab (fig 1). The river Ganga separates it from Jyoti Ba Phule Nagar and Badaun districts. The district is bounded by

Aligarh in south, Gautam Budh Nagar in west and Ghaziabad in the north. The district has 7 tehsils, 16 blocks, and covers an area of 4353 Sq. Kms. with a population **34,98,507(2011)**. The north to south length of the district is 84 km. while east to west width is 62 kms. Wheat, rice, sugarcane, maize and potato are the major crops which are grown in plenty



Source- District Statistical Department of Bulandshahr

DISCUSSION-

Sugarcane has been appeared as one of the most potential market oriented crop in Uttar Pradesh. A large number of sugar mills are being established in the traditional sugarcane growing areas in Uttar Pradesh. In addition, several small sugarcane processing units at village and household level has been established, especially for production of raw sugar (jiggery/gur and khandsari). The growing demand of cane in newly established sugar mills and hike in price per unit weight of the cane products probably encourage the growers to expend the area under this crop (Damodaran and Singh 2007).

Table: 1

S.N.	Name of the crops	Area of the total cultivation area in Sampled Districts in Hectares (2010-11)							
		Muzaffernagar		Bulandshahr		Azmagarh		Sitapur	
		area (hect.)	percent of total cultivated area	area (hect.)	percent of the total cultivated area	area (hect.)	percent of the total cultivated area	area (hect.)	percent of the total cultivated area
1	Wheat	129635	27.38	190934	38.57	236072	44.89	222926	36.00
2	Rice	29631	6.26	63569	12.84	222451	42.30	147119	23.76
3	Maize	110	0.023	53805	10.87	5909	1.12	17225	2.78
4	Barley	329	0.06	7887	1.59	3491	0.66	1852	0.29
5	Other cereals	43	0.009	8283	1.67	34	0.006	6543	1.05
6	pulses	3725	0.78	17683	3.57	18183	3.45	36855	5.95
7	onion	124	0.026	461	0.093	700	0.13	18707	3.02
	other vegetables	5800	1.22	12756	2.57	7797	1.48	7147	1.15
8	Sugarcane	237743	50.22	54942	11.10	19665	3.73	122589	19.80
9	Oilseeds	3121	0.65	7772	1.57	1653	0.31	27089	4.37
10	potato	1996	0.42	6968	1.40	5094	0.96	4141	0.66
11	Fodder	61063	12.90	69876	14.1	4834	0.91	6894	1.11
	Total Area	473320	100	494936	100	525883	100	619087	100

Source- District statistical handbook, 2010-11

If we put a glance on the cropping pattern of the selective districts in Uttar Pradesh, it is clear from table.1, that except Muzaffernagar, in all the districts, the largest area of the total cultivated area is shared by cereals (wheat, rice, maize, barley etc.). The district Muzaffernagar and Bulandshahr are the major producer of sugarcane in western Uttar Pradesh and Azmagarh and Sitapur are the major sugarcane producers of eastern Uttar Pradesh. In Muzaffernagar district the sugarcane cover almost 50 percent area of the total cultivated area while in Bulandshahr, sugarcane covers around twelve percent area of the total cultivated area in the western Uttar Pradesh. On the other hand, if we compare the Azmagarh and Sitapur districts of eastern Uttar Pradesh, in Sitapur district the area under sugarcane cultivation is is around 20 percent of the total cultivable land, while it is only around 4 percent of the total cultivated land in the district Azmagarh. After studying the table of cropping pattern of the sampled districts of the study region, a comparison is made between yield, production, gross and net income in different districts according to their sharing of area under sugarcane.

Table 2: PER CAPITA CONSUMPTION OF SUGAR, GUR/KHANDSARI IN INDIA

S.N	Year	Consumption (Lakh** tonnes)		Per Capita Consumption In (Kg/Annum)		Total per capita consumption of Sugar, Gur/Khandsari Kg/annum
		Sugar	Gur*/Khandsari	Sugar	Gur*/Khandsari	
1	1960-61	21.13	66.87	4.8	15.2	20.0
2	1970-71	40.25	74.37	7.4	13.6	21.0
3	1980-81	49.80	85.22	7.3	12.5	19.8
4	1990-91	107.15	90.71	12.9	10.9	23.8
5	2000-01	162.0	86.09	16.5	8.8	25.3
6	2004-05	181.88	99.77	18.3	10.0	28.3

Source: Cooperative Sugar Vol. 35. No.8, April 2004.

Note- ** one lakh in Indian metric is equal to 0.1 million.

* Gur/ Jaggery are the raw sugar in India appears like a cake.

Table 2 is showing per capita consumption of sugarcane products i.e. sugar and gur /khandsari in india since 1960. Consumption of sugar increased from 21.13 lakh tones in 1960-61 to 181.88lakh tones to 2004-05. Similarly the consumption of gu/khandsari or jiggery increased from 66.87 lakh tones in 1960-61 to 99.77 lakh tones in 2004-05. On the other hand if we see the per capita consumption of sugar and jiggery/ khandsari, that the table is showing that, per capita consumption of sugar increased from 4.8 Kg/annum in 1960-61 to 18.3 Kg/annum to 2004-05, but the consumption of Jaggery/khandsari decreased from 15.2 Kg/annum in 1960-61 to 10.0 Kg/annum in 2004-05, first , it is because that in modern time civilian people prefer to eat bright sugar rather than the rough gur/ jaggery and second is , the numbers of tea drinkers increased from 1960-61 through which people consume good amount of sugar . However, if we see the total per capita consumption of sugar and jiggery/ khandsari, it increased from 20.0 Kg/annum in 1960-61 to 28.3 Kg/annum in 2004-05.

Table: 3COST OF PRODUCTION PER ACRE OF PLANTED AND RATOON SUGARCANE IN SELECTED DISTRICTS OF UTTAR PRADESH

Items	Muzaffernagar			Bulandshahr			Azmagarh			Sitapur		
	Planted	Ratoon	Average	Planted	Ratoon	Average	Planted	Ratoon	Average	Planted	Ratoon	Average
Seeds	3371	-	1631	3257	-	1489	2899	-	1539	3380	-	1865
Ploughing	786	-	380	648	-	323	442	-	235	422	-	233
Fertilizers	1873	2252	2069	1845	2218	2054	1543	1733	1632	2079	2228	2146
PP Chemicals	182	314	250	156	278	243	290	295	292	353	353	353
FYM application	118	-	57	98	-	49	92	-	46	82	-	45
Field preparation	1365	-	656	1240	-	523	1025	-	544	1093	-	603
Planting	1110	-	537	1080	-	494	800	-	425	727	-	401
Intercultural operation	908	1971	1456	865	1836	1375	596	545	572	957	937	957
Other Field operation	122	178	151	100	124	142	50	45	48	55	55	55
Chemical Application	108	112	110	100	94	102	88	84	86	79	79	79
Irrigation	1027	1663	1355	1000	1545	1290	958	1203	1073	1112	1111	1111
Earthing up	340	390	366	310	340	345	396	345	372	390	386	388
Harvesting	1556	1733	1647	1486	1650	1640	489	605	433	1140	1641	1366
Transportation	1184	1682	1441	1098	1643	1398	1089	1146	1115	1137	1209	1169
Interest of Working capital	492	361	424	466	342	398	369	210	295	455	281	377
Land revenue/taxes	92	93	92	88	45	87	81	80	80	111	110	110
Depreciation	1258	1421	1342	1189	1348	1250	1067	1222	1140	959	962	960
Interest on fixed capital	1219	1279	1250	1178	1156	1134	960	1099	1025	863	866	865
labour	1691	1583	1635	1568	1458	1789	227	2290	2256	2314	2320	2317
Total	18792	15032	16849				1525	10902	13211	17710	12558	15400
				17772	14077	16125	4					

Source- National Federation of Co-Operative Sugar Factories Ltd., New Delhi, Co-Operative Sugar, vol.40. no.10, June 2009.

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The above table (Table: 3) is showing cost of production per acre of sugarcane in selected four districts of Uttar Pradesh in case of planted and ratoon sugarcane. For sugarcane cultivation farmers have to expand a large amount of money on field preparation, seeds, FYM application, Fertilizers, planting, chemical application, harvesting, transport, labour etc. farmers have to expand a large amount of money on planted sugarcane in case of ploughing, seeds, machinery, earthing up etc. but on the other hand, this is a large saving in case of ratoon sugarcane.

In Muzaffernagar district the average cost of seed in planted is Rs. 1631, ploughing Rs.380, other type field preparation Rs. 656, and earthing up Rs.266. in Bulandshahr district it is Rs.489 on seeds, Rs.323 on ploughing, Rs. 523 on other types field operations, and Rs. 396 on earthing up. In case of the districts of eastern Uttar Pradesh, the per acre cost on seed is Rs.1596, ploughing Rs. 235, other field preparation Rs. 544, and earthing up Rs.390 in Azmagarh District, similarly, in Sitapur district, cost for seeds is Rs. 1865, ploughing Rs. 233, field preparation Rs. 603, and on earthing up Rs. 388. While in case of ratoon sugarcane farmers do not have to expand money on such items. But the farmers have to expand a large amount of money in both the categories (planted and ratoon) of sugarcane in case of irrigation, fertilizers, harvesting, transportation etc. in all the districts of Uttar Pradesh. The cost of irrigation is highest in Bulandshahr district (Rs. 1545) followed by Muzaffernagar (Rs.1355), Sitapur (Rs. 1111) and Azmagarh (Rs. 1073). But the cost of harvesting and transportation is highest in Muzaffernagar district (Rs.1647 and Rs.1441) followed by Bulandshahr (Rs. 1640 and Rs. 1398), Sitapur (Rs. 1366 and Rs. 1169) and Azmagarh district (Rs. 433 and Rs. 1115) respectively. But the conditions are reversed in case of labour cost as it is highest in Sitapur district (Rs.2317), followed by Azmagarh (2256), Bulandshahr (Rs. 1789), and Muzaffernagar (Rs.1635), it is because that the district of western Uttar Pradesh are traditionally sugarcane growing area and here it is the one of the most important crop, so the people are trained that hoe to cultivate sugarcane, they can do their work personally. On the other hand the districts of eastern Uttar Pradesh people are not so much trained in the cultivation of sugarcane, so here the largest work is done by the labour. Apart from this farmers have to expand money for FYM application, interest of working capital, depreciation, interest of fixed capital etc. in sugarcane cultivation.

Table: 4 PER ACRE Yield, GAROSS Income, COST OF PRODUCTION AND NET INCOME FROM RATOON SUGARCANE OF SMALL AND LARGE FARMERS IN SELECTED DISTRICTS OF UTTAR PRADESH

ITEMS	Muzaffarnagar District			Bulandshahr District			Azamgarh District			Sitapur District			UTTAR PRADESH		
	Small Farmers	Large Farmers	All farmer s	Small Farmers	Large Farmers	All farmer s	Small Farmers	Large Farmers	All farmer s	Small Farmers	Large Farmers	All farmer s	Small Farmers	Large Farmers	All farmer s
Yield(Quintals)	262.14	278.02	274.27	220.2	285.5	292.7	220.2	181.5	200.3	235.0	229.7	231.8	234.3	243.6	239.0
Gross income(Rs.)	26424	29776	28100	28623	30112	29367.5	20174	18425	19299.	23579	24303	23941	24700	25654	25177
Cost of Production(Rs)															
without imputed value of Family Labour	12551	13727	13449	12702	11878	19878	8568	8657	8612	10211	10258	10238	11008	11130	11069
With Imputed Family Labour	15318	14943	15032	14470	15287	15437	11088	10730	10902	12791	12402	12558	13416.7	13340.5	13378.6
Net Income Rs.															
without imputed value of Family Labour	13873	16049	15534	13773	16877	16513	11606	9768	10663	13368	14045	13773	13155	14184.7	13669.8
With Imputed Family Labour	11106	14833	13951	12217	14471	14212	9086	7695	8373	10788	11901	11453	10799.7	12225	11512.1

Source- National Federation of Co-Operative Sugar Factories Ltd., New Delhi, Co-Operative Sugar, vol.40. no.10, June 2009.

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Note- One Hectare is equal to 2.5 Acres in India.

Table 4 present data related to net income realized from ratoon sugarcane by small and large farmers in these four districts. The net income from ratoon sugarcane with imputed value of family labour in UttarPradesh amounted to Rs. 11512.1/acre. This was higher in case of large farmers(12225) when compared to the small farmers(Rs. 10799.7). Higher income generation of large farmers was associated marginally higher yield, being 243.6 quintals/acre as against 234.3

quintals/acre obtained by small farmers, marginally higher gross income generation, being Rs. 25654 as against Rs. 24700 by small farmers and marginally lower cost of production than that of small farmers.

With imputed family labour the net income from ratoon sugarcane per acre was maximum in Bulandshahr District (Rs. 14212) followed by Muzaffernagar (Rs. 13951), Sitapur (Rs. 11453) and Azamgarh (Rs. 8373). The lowest income generation through ratoon sugarcane could be attributed to lowest yield 200.3 quintals/acre in Azamgarh as against to 231.8 quintals in Sitapur, 274.1 per acre in Muzaffernagar and 292.7 quintals per acre in Bulandshahr district, as lowest gross income generation in Azamgarh (Rs. 19299), as against Rs. 23941 in Sitapur, Rs. 28100 in Muzaffernagar district and Rs. 29367.5 in Bulandshahr district.

Table: 5 PER ACRE Yield, GAROSS Income, COST OF PRODUCTION AND NET INCOME FROM PLANTED SUGARCANE OF SMALL AND LARGE FARMERS IN SELECTED DISTRICTS OF UTTAR PRADESH

ITEMS	Muzaffarnagar District			Bulandshahr District			Azamgarh District			Sitapur District			UTTAR PRADESH		
	Small Farmers	Large Farmers	All farmers	Small Farmers	Large Farmers	All farmers	Small Farmers	Large Farmers	All farmers	Small Farmers	Large Farmers	All farmers	Small Farmers	Large Farmers	All farmers
Yield (Quintals)	248.16	259.32	255.90	224.6	238.3	231.45	187.60	179.55	182.32	230.60	222.50	225.67	222.7	224.91	223.8
Gross income (Rs.)	25015	27773	26928	23823	25715	24769	17184	18224	17867	23129	23541	23380	22287.7	23813.2	23050.5
Cost of Production (Rs)															
without imputed value of Family Labour	16266	17466	17101	15842	16842	16342	12915	13082	13025	15495	15334	15396	15129.5	15681	15405.2
With Imputed Family Labour	19033	18682	18792	18312	18148	18230	15435	15155	15252	18075	17478	17710	17713.7	17365.7	17539.7
Net Income Rs.															
without imputed value of Family Labour	8749	10307	9827	7923	9365	8644	4269	5142	4842	7634	8207	7984	7143.7	8255.25	7699.5
With Imputed Family Labour	5982	9091	8136	5312	8643	6977.5	1749	3069	2615	5054	6063	5670	4524.2	6716.5	5620.3

Source- National Federation of Co-Operative Sugar Factories Ltd., New Delhi, Co-Operative Sugar, vol.40. no.10, June 2009.

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Table 5 present data related to net income realized from planted sugarcane by small and large farmers in these four districts. The net income from planted sugarcane with imputed value of family labour in UttarPradesh amounted to Rs. 5620.3/acre. This was higher in case of large farmers(6716.5) when compared to the small farmers(Rs. 4524.2). Higher income generation of large farmers was associated marginally higher yield, being 224.91 quintals/acre as against 222.7 quintals/acre obtained by small farmers, marginally higher gross income generation, being Rs. 23813.2 as against Rs. 22287.7 by small farmers and marginally lower cost of production than that of small farmers.

With imputed family labour the net income from planted sugarcane per acre was maximum in Muzaffernagar District(Rs. 8136) followed by Bulandshahr (Rs. 6977.5), Sitapur (Rs. 5670)and Azmgarh(Rs. 2615). The lowest income generation through planted sugarcane could be attributed to lowest yield 182.32 quintals/acre in Azmagarh as against to 225.67 quintals in Sitapur, 231.45 in Bulandshahr district and highest ie. 255.90 quintals per acre in Muzaffernagar District, lowest gross income generation (Rs. 17867), as against Rs. 23380 in Sitapur, Rs. 24769 in Bulandshahr and Rs. 26928 in Muzaffernagar district.

Table 6 is showing the share of individual of enterprises in the total farm income shows that except vegetables in the category of marginal farmers, in all the farms sugarcane, cereals and livestock are the major far enterprises which contribute about 85 percent of the farm income. Sugarcane along contribute about 39.33 percent of total income in its share, which increased with the increase in the size of holding. Livestock was the second most important source of income among the marginal and small farmers, while this is overtaken by the cereals among the other category of the farms (medium and large).

Table:6 PER FARM GROSS INCOME FROM DIFFERENT COMPONENTS OF FARMING SYSTEMS IN BULANDSHHAHR DISTRICT OF WESTERN U.P

PARTICULARS	MARGINAL	SMALL	MEDIUM	LARGE	ALL FARMS
Size of holding	0.78	1.89	2.94	5.7	2.82
cereals	15.23	17.54	15.26	14.84	15.7175
sugarcane	2.45	52.47	49.84	52.57	39.3325
vegetables	54.45	4.40	1.64	0.59	15.27
pulses	1.02	0.18	5.86	0.71	1.9425
fodder	0.00	1.84	0.55	1.7	1.0225
mustard	1.00	4.73	4.97	2.74	3.36
orchards	0.00	0.14	1.57	10.60	3.0775
livestock	25.86	18.47	13.27	11.45	17.2625
income from hiring out of farm machinery	0.00	0.77	8.07	1.76	2.65
total	100	100	100	100	100
Gross income (Rs)	73455	120489	312456	428943	233835.8

Source- Field Survey November, 2010

Note- One Hectare is equal to 2.5 Acres in India.

Sugarcane – wheat was the major farming system in the terms of area coverage (table 6) and cover about 70 percent of the total cropped area in this district. As farm size increased the area under sugarcane also increased. It indicate that marginal and small farmers were most dependent on the wheat crop, vegetable and livestock as they are their major source of income., while medium and large farmers were more interested in growing sugarcane being cash crop. The reasons behind the sugarcane cultivations are- firstly, sugarcane being a hardy crop, can tolerate more/less or water/delay in harvesting, secondly, sugar mills provide good services and the government provide price support for this crop. During the field survey farmers accepted that they get higher benefit from sugarcane. It was happened due to establishment of new sugarcane mills in the traditional sugarcane growing areas(Rehman 2004). However, the field study shows that high economic return, low labour intensive, least mental stress were main cause to boost up sugarcane cultivation.

Table 7, is showing the per hectares yield, gross income, cost of production and net income from ratoon and planted sugarcane in district Bulandshahr. At the time of field investigation in sampled 10 villages all category of farmers were selected and they gave their detail information from investment to the level of profit from both classes of the sugarcane. If we compare the investment in planted sugarcane and ratoon sugarcane, then it is clear from the table that the cost of seeds/ plough is not there for ratoon sugarcane, so there is a saving for Rs. 3568.2(excluding seeds, plough, insects and pests) per hectare in case of

ratoon sugarcane. The investment on fertilizers is almost same in all farms in both classes of sugarcane. The investment on insecticide and pesticides is slightly more on planted sugarcane than the ratoon sugarcane. In this case if we see the different categories of the farmers, than it is clear from the table that in both the category of sugarcane large farmers invests more on the new technology i.e. seeds, fertilizers, insecticides, pesticides, machinery etc. than the other category of the farmers.

Table 7: PER HECTARE YIELD, GROSS INCOME, COST OF PRODUCTION AND NET INCOME FROM PLANTED AND RATOON SUGARCANE IN BULANDSHAHR DISTRICT (Rs. /HECTARE)

Items	PLANTED SUGARCANE					RATOON SUGARCANE				
	MARGINAL	SMALL	MEDIUM	LARGE	ALL FARMS	MARGINAL	SMALL	MEDIUM	LARGE	ALL FARMS
seeds	4223	4168	2986	2896	3568.25	0	0	0	0	0
fertilizers	1549	2214	3761	4739	3065.75	1549	2214	3761	4739	3065.75
insecticides/ pesticides	225	527	697	753	550.5	-	--	-	-	-
irrigation	1073	1447	837	927	1071	1073	1447	837	927	1071
LABOUR										
without imputing family labour	4128	4108	4217	4212	4166.25	3467	3212	3334	3467	3357
with imputing family labour	129	137	1398	1327	1314	0	0	1251	1267	1243.75
Average Labour	2712.5	2743.5	2807.5	2769.5	2758.25	2350.5	2217.5	2292.5	2367	2300.375
machinery	5312	4233	3765	1567	3719.25	-	-	-	-	-
transport	2789	3457	3500	3830	3394	2789	3457	3500	3830	3394
total input cost	17883.5	18789.5	18353.5	17481.5	18127	12096.5	13296.5	13567.5	15424	13589.63
yield in quintals/hectare	553	578	583	598	578.25	567	584	592	598	585.25
Net Income										
total return in Rs.	59724	62424	62964	64584	62451	61236	63072	63936	64584	63207
Benefit	41840.5	43634.5	44613.5	47102.5	44324	49139.5	49775.5	48512	49160	49617.3

Source: Personal Investigation November 2010.

Note- price of sugarcane during the field survey were 108 Rs/ Quintals.

If we see the total input cost on both category of sugarcane (Ratoon and Planted) in all the categories of farmers in Bulandshahr district, the expansion on seeds on planted sugarcane is Rs. 3568.25 which is highest in marginal and small categories of farmers, while it is almost half in case of medium and large farmers, because they have their own prepared seed, while in case of

ratoon sugarcane, there is no expansion on seeds. However, the other benefit in case of ratoon sugarcane is, the farmers need not to expend money on land preparation, insecticide and pesticide (very little amount of money) and on machinery(Table:7). While, in case of planted sugarcane the expansion on insecticide/pesticides (Rs.550), and machinery (Rs.3719.25)is very high and here also the expansion is more in case of marginal and small farmers because they do not have easy access to the insecticides and pesticides and machinery and also they have to pay a commission to the middle who help they to provide these inputs. On the other hand, the labour cost in case of planted sugarcane with imputing family labour, it is higher in medium(Rs.1398) and large farmers (Rs.1327) than the marginal(Rs.129) and small farmers(Rs.137), similarly, in cae of ratoon sugarcane the labour cost with imputing family labour is negligible in case of marginal and small farmers and is Rs. 1251 and Rs. 1267 in case of medium and large farmers. The marginal and small farmers have to pay some cost for the labour used for planting the sugarcane, but in case of ratoon sugarcane they do their work themselves with their family. In one hand, if we put a glance on the total input cost in both the categories of sugarcane, it is Rs. 17883.5/hectares in case of marginal farmers, Rs. 18789.5/hectares in case of small farmers, Rs.18353.5/hectares in case of marginal farmers, and Rs. 17481.5/hectares in case of large farmers in the category of planted sugarcane. On the other hand, the total input cost in the category of ratoon sugarcane is, Rs. 12096.5/hectares in case of marginal farmers, Rs.13296.5/hectares in case of small farmers, Rs.13567/hectares in case of medium farmers and Rs.15424/hectares in case of large farmers. The small and marginal farmers have to expend a large amount of money on seeds, fertilizers, insecticides/pesticides, machinery etc. that is why their input cost on planted sugarcane per acre is more than large farmers, while in case of ratoon sugarcane they do not need to expend a huge amount of money on such inputs so their cost of input is lower than the medium and large farmers. In case of benefit in planted sugarcane, expanding a large amount of money, the marginal (Rs. 41840.5), small (Rs.43634.5), farmers do not get as good return/ hectares than the medium (Rs. 44613), and large(Rs.47102.5), because almost the medium and large farmers have their own facilities of machinery and easy access to fertilizers, insecticides/pesticides, irrigation , seeds etc. on the other hand, in case of ratoon sugarcane the total benefit in all the category of farmers is almost equal.

JAGGERY (GUR) UNITS OR KOLHU UNITS

There are only small types of crushing *or kolhu* *units in the study area (Bulandshahr district) and the medium and large types of *kolhu* units are very less. The traditional type of *kolhu* is only for home produced sugarcane and purchase very little sugarcane for business. In the district Bulandshahr most of the *kolhu* are small sizes which are also for commercial purpose. A team of farmers/ enterprenures operate the machine, land, pumping set/generator on lease and running the *kolhu* units in sugarcane growing areas. They were purchasing sugarcane directly from farmers, primarily from the small farmers, who found it a little bit difficult to supply sugarcane to sugar mills. Usually the prices offered by *kolhu* units were lower than that offered by the sugar mills by Rs 35 to Rs. 40 per quintals. However, during the period of shortage of sugarcane, they offered a higher price than that offered by sugar mills.

Table :8 TYPES OF PRODUCTION UNITS IN SAMPLED VILLAGES

	SMALL UNIT	MEDIUM UNIT	LARGE UNIT
PRODUCTION CAPACITY (Finished Gur in a working day)	Upto 10 quintals	11-25 quintals	25-30 quintals
CRUSHING CAPACITY (In a working day)	75-100 quintals	100-200 quintals	200-250quintals
CAPITAL INVESTMENT (for establishment of unit)	Rs. 1 - 2.5 Lakhs	Rs. 2.5 - 3.5 lakhs	Rs. 3.5 to 4.5 Lakhs

Source - Field Investigation in November 2010

Note- Small size of units has been directly observed by author, but medium and large size of units have been discussed by enquiry of the farmers by the author.

**kohlu* is the local name of small unit sugarcane crusher.

The capital investment in establishing a Gur Unit or plant is around Rs. 200000 to Rs. 550000, which can produce from 5 to 30 quintals, finished marketable Gur every working day. On the basis of data and observation, working units were classified in three categories on the basis of their production size:

Small Units: Small units have their production capacity up to 10 quintals per day and sugarcane crushing capacity of around 75 to 100 quintals per day. The capital investment in establishment of this size of plant is around Rs. 100000 to Rs. 250000 where cost of land and building is not included (Table.8)

Medium Unit: Medium Unit has production capacity of 11 to 25 quintals per day and sugarcane crushing capacity of around 100 to 200 quintals per day. The capital investment in establishment of this size of plant is around Rs. 250000 to 350000 where the cost of land and building is not included.

Large Unit: Large Unit has production capacity of 26 to 30 quintals Gur per day and sugarcane crushing capacity of around 200-250 quintals per day. The capital investment in establishing of plant around Rs. 350000 to 450000 where cost of land and building is not included. The process of Khandsari/ Gur production in these units is as follows-

**Crushing of Cane ----- Juice Filter ----- Boilers ----- Crystallizer ----- Centrifugal Machine/
Molasses for Gur Making**

Bulandshahr District is dominated by the small Gur processing Units. The number of the Medium Processing Units are small but large processing units are rarely found.

The Gur manufacturing plants are generally using vertical roller type crusher for juice extraction and it operated by diesel-engines because it was found that electric supply is not suitable for this business in rural area of this district.

In Uttar Pradesh , there has been an increasing trend in the production of sugar and a declining trend in the production of gur including khandsari over a period of year. Thus, while the production of sugar increased from 37.29 lakh tones in 1998 to 56.51 lakh tones in 2002-02, the production of gur including khandsari decreased from 59.13 lakh tones to 31.89 lakh tones during the same period (NFCOSFL, June 2009).

COST AND RETURN ANALYSIS FROM GUR/JAGGERY MANUFACTURING UNITS

The result of cost and return analysis as a measure of profitability among Gur/Jaggery manufacturer exposed that large size Gur manufacturing units has an average cost of of Rs. 59867/- and revenue of Rs. 84345/- respectively with a profit of Rs. 1124/- per day. Similarly, in the medium size of production units average total cost and total revenue recorded as Rs. 52116/- and 72625/- respectively with an average profit of Rs. 20509/- per day. Like this, in small size of production units an average total cost and total revenue of Rs. 25090/- and Rs.26214/- per day , with an per day average profit of Rs.1124/- respectivel(Table. 9).

Table: 9 SUMMARY DISTRIBUTION OF PER DAY COST AND RETURN ANALYSIS OF GUR/JAGGARY MANUFACTURING UNITS IN DISTRICT BULANDSHAHR

PARAMETERS	SMALL	MEDIUM	LARGE
Total Cost inRs.	25090	52116	59867
Total Revenue in Rs.	26214	72625	84345
Profit (pt)in Rs.	1124	20509	24478
Profitability Ratio (pt/TC)	0.044	0.393	0.408
Efficiency Ratio (TR/TC)	1.044	1.393	1.408

Field Investigation in November 2010

The study shows that small size manufacturing unit have very marginal profit per day but in the case of medium and large manufacturing unit we can say that these medium and large size units are able to cover their operating expansion with significant level of profit and can fetch out their expansion of plantation within a year.

However, the per day profitability ratio of the small, medium and large manufacturing units which is , 0.044, 0.393 and 0.408 respectively. This means that every Rs. 100 invested by small, medium and large units each gained Rs. 4.4, 39.3 and 40.8 respectively. Similarly the efficiency ratios of small, medium and large units are 1.044, 1.393 and 1.408 respectively (Table 9). It means that the whole sampled manufacturers are having a positive efficiency ratio and it is an indication of efficient business operations.

PROBLEM FACING BY GUR/JAGGERY MANUFACTURERS IN BULANDSHAHR DISTRICT

There are many problems which are faced by the sugarcane growers. The farmers expressed the following problems in supplying of cane to sugar mills which force them to supply sugarcane to Gur/ Jaggery and Khandsari producing units at lower prices.

- Mills, particularly the cooperative mills that operate through cane societies, give preference to the large and influential farmers in giving cropping cutting orders and the small farmers usually lose on this ground. Such farmers affect the small farmers at a great extent as they like to grow one crop of wheat in between the two crops of sugarcane. This forces the small farmers to sell their crops to khandsari/ Gur manufacturers units.
- Low market prices of sugarcane and untimely supply of payment is the another major problem of the sugarcane growers in the Uttar Pradesh.
- Wild animal like wild pigs, blue bull, Jackals etc. have become a major problem for the sugarcane cultivation as they destroy a large area of sugarcane within a week.
- Transport charge is the major problem of the sugarcane cultivators, as they have to pay a large amount of money for transport from field to mills.

In the study region it has been observed that all the manufacturer whether small, medium and large are facing common problems. But the impacts of these problems differ within these categories. Such as low profit is the major problem of small manufacturers while the transportation charge is the major problem of medium and large manufacturers. Apart from this continuous increasing diesel prices is one of the major problem of these manufacturers.

Due to increased awareness among the sugarcane growers, the sugar mills are forced to pay the State Advised Price (SAP) announced by the government and the payment are to be made within 14 days from the date of cane supply. This had led to increased loyalty of the farmers towards toward sugar mills. Further, most of the Gur manufacturing units try to procure cane at cheaper price as the SAP is binding only on sugar mills. Generally, the large farmers are able to deliver their cane to mills without much difficulty. Paying high prices by sugar mills has affected the viability of Gur/Jaggery, Khandsari Units. The competition in the cane purchasing markets has increased, due to the increasing number of sugar mills, particularly in the private sector which create problem in adoption of raw material to the Gur/ jaggery manufacturer.

CONCLUSION AND SUGGESTIONS

Although sugarcane is one of the most important crop of the Uttar Pradesh but in spite of this the largest area is shared by the cereals. Here farmers are following traditional farming system, which does not provide adequate income for their good living. There is a need to develop area under sugarcane, yield and production, low cost technology to bring down the cost of cultivation. Technologies like simultaneous planting of sugarcane with wheat using improved varieties and site-specific nutrient management with emphasis on balanced nutrition deserve due attention for increasing profitability of sugarcane based farming system. (Anonymous, 2007). In the study area as well as in Uttar Pradesh there are large numbers of Gur/Jaggery and Khandsari manufacturers units. The inference of this finding of this paper is that the sugarcane cultivation as well as Gur manufacturing has the potential of improving the standard of living of the people of their cultivators in the village areas. If the government provide good prices of farmers for sugarcane, and low cost input technology for the farmers, then with the development of this farming the problem of the unemployment of many youths of the rural area can be solved.

SUGGESTIONS TO OVERCOME FROM THESE PROBLEMS

- Those manufacturers, who are facing producing at medium and large size of production is able to generate good profit but small are just to able to save their wages. It was found that if small unit is scale-up upto medium level of production it could become a profit oriented unit.
- There is need for improving transport facilities for this industry. It was found that the Gur/Jaggery manufacturers are not in a mindset form any kind of association of society for the cluster's development.
- Government should reduce down the continuous increasing of the prices of diesel.
- There is need for financial assistance and marketing support to small manufacturers, they are not able to expand their business because of tough competition and low profit.

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