

Investigation on socio –economic factors of rice straw burning in central and western county in Guilan Province.

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ABSTRACT: Straw is a byproduct of rice farming that in the past was used in the livestock feed, making and lined the walls and covering rural housing roof, crafts and other case. At the present time, many applications of this product have declined and after harvesting paddy on the farm or along the roads between the fields are burned. In this study, social and economic causes of burning straw will be examined. For this purpose, in the regions and villages in west and central province, 226 questionnaires were completed among 23 villages of the mentioned area. The results confirm the evidence and perspectives of author on the roots of the reasons, some of which are as follows: 51 ones of total respondents (22/6 percent) are kept livestock and 70/8% of respondents stated that they hold more livestock in the past. Those who keep livestock and poultry do not used of straw to building and covering the roof for livestock and poultry. They suggested the lack of technical feasibility and application of materials used in the current situation as the main reason for it. Also, all the statistical community is not used straw in rural housing construction and only 5 people have claimed that they have furniture of straw materials at home. On the other hand, 215 respondents who burn all the straw from the paddy stated that during extraction, the customer has not been referred to buy straw. 223 people have also stated that from industries and factories owners and even cooperatives and farmers associations also have not been referred to buy straw. 223 people have stated that if the straw after harvesting the paddy is not burn in farm and to stay in situ, there is not the possibility to prepare the ground in the next year and can not plowed land. In addition to these, 196 people have claimed that there is not baler system in the village where they live. In the end of the research some proposals to address this problem in 3 short, medium and long terms is presented.

INTRODUCTION

Guilan province where has an area of less than 1 percent from the whole country, about 317 037 households are engaged in farming operation. Of these, approximately 256 737 are operate in agricultural sector. According to the General Agricultural Census 1382, the total land area of the province was 198 456 hectares, from this amount, 73 006 hectares is irrigated land and 20 959 hectares is devoted to dry land. Rice accounts for most of the irrigated agriculture and agricultural land area under rice cultivation based on the general census of 1382 is about 160 099 hectares.¹ According the same source, about 205 329 households are operate in this field. The production of rice (paddy) in this province is 553 327 tones and the average per hectare is 3456 kg. Based on these statistics, utilizations of total paddy rice production in the country is 517 280 operation that about 40 percent of them are operation in the Guilan province. The total amount of rice plantation land in the country is equal to 465 478 hectares and about 34/4 percent of rice land has been located in Guilan that from 1819176 tones country's paddy production, about 30/4 percent is produced in Guilan Province. Most of the rice acreage is in Rasht city with 42 602 hectares and Amlash is lowest rice acreage with 2043 hectares.

Now, different varieties of rice are cultivated in Guilan Province. One of the byproducts produced from rice agricultural is straw that according to the Agriculture Jihad Organization of Guilan, the annual production value of it is 1/2 million tons. Major uses of straw from the past to present is include livestock feed, roof covering housing and ancillary facilities of rural households as well as some household crafts. Traditionally, in

addition to covering the roofs of houses and facilities was also used in preparing the mud (straw mud) needed to build the wall in rural buildings.

Straw extracted from rice by geographic and climatic conditions of Guilan and possible constraints for forage plants such as hay plays an important role in livestock nutrition. In recent years, relatively large amounts of extracted straw are burned in the fields that in addition to wasting resources are also associated with environmental hazards. Based on evidence, this practice has been more common in Central and West province than the other areas. The present study attempted to explore the social and economic causes of burning rice straw in Central and West regions of the province and it performed followed the order of Agriculture Jihad Organization of Guilan.

MATERIALS & METHODS

The present study is a type of survey and was conducted by descriptive- analytical and correlation method. Population of this research is farm households living in rural regions of Central and West of Guilan including cities of Rasht, Soumesara, Anzali and Astara. The main and dependent variable is the burning of straw and effective and independent variables of the research are included: Livestock and Poultry, type of materials used in housing and ancillary facilities in rural households, extraction method of paddy from straw and a straw buyer including local people, farmers and ranchers in other villages, industry and factories owners, cooperatives companies and farmers associations and the like; Due to unknowing of the population of households that are burning straw, to determine certain size of statistical population and sample was not possible until using conventional methods the sample size was determined, but with enough cover about 226 questionnaire from farmer households were completed. In addition to questionnaires, observations, interviews with local experts and trusted colleagues (Islamic councils and rural council) and reviewing documents and written sources has also been used. Data collected by questionnaire after extraction and coded entered into spss software and processed. In the data description, the center indicators have been used and in order to analyze them, chi square test (X^2) and Pearson and Spearman coefficient has been used.

Research objectives

The main purpose of this research is to clarify the social and economic causes burning of rice straw in Guilan province and some sub-goals is as followed:

- 1 - A more accurate understanding of the regions and rural areas where straw is burned.
- 2 - Understanding the use of agricultural machinery and mechanization in the studied areas of the whole province.
- 3 - Understanding the changes in the quantity of livestock of the studied areas
- 4 - Understanding the changes in the way of construction of housing and ancillary facilities in the rural household.

Research question / hypothesis

- 1 -In particular, in what rural areas of the province they burn straw?
- 2 - When it has been common and has been in what recommendations / scientific or executive achievement?
- 3 – What were the main uses of straw from the last to now and what were changes and developments?
- 4 - Is the amount that burned in excess of the usual cost?
- 5 - What has changed the practices, planting and harvesting rice in the past to present?
- 6 - What changes and developments have occurred in the condition of livestock in the province?
- 7 - What changes are there in the construction of rural dwellings and ancillary facilities required for household (storage, maintenance status of livestock and poultry)?
- 8 – How is the status of mechanization and use of agricultural machinery in harvesting rice?
- 9 – What were the achievements of research projects in the field of utilization of rice byproducts such as straw in production of other products and which one has found administrative and manufacturing aspects?
- 10- What have done the organizations associated with livestock in providing forage inputs? And whether they have done some efforts in the field of collecting, packaging and straw purchases in excess of farmers consumption?
- 11 - Whether the legal and environmental laws and regulations concerning the results of burning straw and punish the perpetrators is formulated and implemented?

RESULTS

Descriptive Statistics

General characteristics of respondents

Age

Respondents of this research were classified in the sixth age group (25-29) to the last age group (Fourteenth group), ie +65. The most frequent is related to the age group 50-54 with 50 respondents (22/1 percent) and generally 81/8 percent of respondents are in the 45-49 age groups to the last group of +65. Persons under 44 years have formed 18/2% of the respondents.

Level of education

In this trait, education level of respondents is in 7 rating including: 1- Illiterate, 2- Literacy Movement/ literacy in the extent of reading, writing and elementary, 3- Guidance school, 4- Secondary, 5- Diploma, 6- Associate Degree , 7- BA or higher were classified. Accordingly, 101 respondents had the education level as reading and writing followed by guidance, diploma and illiterates.

Jobs / careers

In the questionnaire, six occupational groups were considered include: 1- Agricultural, 2- Employee, 3- shop doer, 4- Labor, 5- Public services (with name), 6- Other jobs (with name). Many respondents have had 2 or 3 jobs. Overall, 116 one had two jobs that in this context, the combined businesses, agriculture + public services, 30 individuals (12/3 percent), agriculture + labor, 24 individuals (10/6 percent), agriculture + employee 15 individuals (6/6 percent) have the highest repetition frequency in 3 jobs individuals. The 104 individuals equal with 46 percent of respondents expressed their jobs merely agriculture. Among the respondents three people had three jobs.

Inferential statistics

In the present study, the burning of straw is dependent variable and variables influencing the research that in researchers view are involved in the burning of straw are: 1- Animal care and maintenance and no care, 2- Presence / absence of agricultural storage, 3- Materials used in construction of agricultural storage, 4- Materials used in construction of residential house and its roof, 5- Materials used in construction sites for livestock and poultry maintenance, 6- Straw used in furniture, 7- Go / no go of the customers to buy straw immediately after extraction paddy in the farm, 8- Go / no go of farmers and ranchers to purchase straw, 9- Go / no go of cooperatives and farmer associations to buy a straw, 10- Go / no go of industry and factories owners to purchase straw, 11- Go / no go for legal persons and natural persons to packaging and collecting rice straw left on the farms in voluntary, 12- Presence / absence of baler device in place during the harvest.

Since the measure scale of listed variables is nominal, so to determine the level of relations between variables, Correlation coefficient X^2 (chi square) as well as Pearson and Spearman correlation coefficients were used.

Between The Materials Used In Construction Of Agricultural Storage And Burning Of Straw

According to the results of X^2 test with 99% confidence, there is a relationship between the two variables. In this table, x^2 test is as follows:

	Value	df	Asymp-sig(2-sided)
Pearson chi- square	13/742	1	0/000

Between the use of straw in the furniture and burning straw

Again by X^2 test with 99% confidence, there is a relationship between the two variables. The table of x^2 test is as follows:

	Value	df	Asymp-sig(2-sided)
Pearson chi- square	11/001	1	0/001

The Pearson correlation between two variables based on the amount of correlation = 0/343 with $N = 117$ a significantly level obtained in $\text{sig} = 0/000$ with 99% confidence, so there is an inverse correlation between two variables. Calculation of Spearman correlation coefficients between two variables also shows the same results.

Between the way of harvesting paddy from straw and burning straw

Again by X^2 test with 95% confidence, there is a relationship between the two variables. The table of x^2 test is as follows:

	Value	df	Asymp-sig(2-sided)
Pearson chi- square	4/241	1	0/039

In addition to X^2 test with calculation of Spearman correlation coefficients with the value of correlation=0/137 and N=225 and sig=0/040, there is a correlation between two variables with 99% confidence.

Between farmers and ranchers referral and burning the straw

Due to the result of X^2 test with 95 and 99% confidence, there is not a relationship between two variables, however sig=0/060 is near to the relationship between two variables (About 94% confidence).

Between baler device and the burning of straw

Again by X^2 test with 95% confidence, there is a relationship between the two variables. The table of x^2 test is as follows:

	Value	df	Asymp-sig(2-sided)
Pearson chi- square	3/890	1	0/049

By calculating Pearson and Spearman correlation coefficients with the value of correlation=0/132 and N=224 and sig=0/049, there is an inverse correlation between two variables.

Between the referral those who collect and sort of burning straw and burning the straw

According to the results of X^2 test with 99% confidence, there is a relationship between the two variables. In this table, x^2 test is as follows:

	Value	df	Asymp-sig(2-sided)
Pearson chi- square	77/199	1	0/00

By calculating Pearson and Spearman correlation coefficients with the value of correlation=0/615 and N=204 and sig=0/000 and 99% confidence, there is an inverse correlation between two variables. For some variables only the Pearson correlation coefficient was calculated. The results are as follows:

Between the livestock maintenance site and burning straw

Calculating the correlation=0/399 and N=51 and sig=0/004, with 99% confidence, there is an inverse correlation between two variables.

No economical of livestock maintenance and burning

Calculating the correlation=0/146 and N=184 and sig=0/047, with 95% confidence, there is an inverse correlation between two variables.

Between the materials used in the manufacture of native birds and burning

Calculating the correlation=0/362 and N=188 and sig=0/00, with 99% confidence, there is an inverse correlation between two variables.

Between no protest of people to burning and burning straw

Calculating the correlation=0/248 and N=221 and sig=0/00, with 99% confidence, there is a correlation between two variables.

CONCLUSION

Rice straw burning issue began from the mid-70s and generally became common in all parts of the province. This problem is very severe in some parts of the province than other parts of the province. In rural areas where tissue has been less change or in the surrounding villages had a thriving livestock, farmers after harvest has fed resulting straw to livestock or selling it to ranchers settled in the mountainous regions. In some parts where there was speed modernism and changes in the construction (Including the cities surrounding Rasht, Anzali villages and surrounding Astara) due to lacking the need, high labor costs and lack of affordable, straw is burned (the easiest possible) and now also in the areas mentioned above, this trend has continued with less intensity. Some time in recent years, size of fire and smoke from burning straw around Rasht (Alman

and Pastak) would have trouble landing the aircraft and in fact, since then prevent it from were on the police agenda. Over the past three years with introducing the baler system that belong to the seasonal migrants of Ardebil, Mazandaran and Golestan, this issue was somewhat reduced. And with baler devices distributed among farmers and provincial applicants through the allocation of banking facilities, the work intensity was reduced. In addition, the incidence of drought in the country and reduce forage production in the provinces producing forage leading to increased hay prices, and it was turning to rice straw. According to statistics and predictions of Agriculture Jihad Organization and assuming the stability of devices that can be entered in the harvest season, to the end of years 88 only 30 percent of the required fields are provided.

Burning issue was never from the scientific - technical recommendation and or extension. Extension experts make recommendations to the water table of the fields and plots in winter only when the winter plowing fields that in the effect of this action and sometimes the incidence of glacial, many pests including rice stem borer may have destroyed. Experts also recommend that after carrying out the plowing and water table try to burning of the grass along the plots (on the ridge of plots). The act also eliminates pests gathered in this section.

The evidence and farmers answers also confirms that in addition to causes such as being less its uses, straw burning was started by entering combine into the rice fields (from years 74 onwards). As already mentioned, the problem of transported paddy to the warehouse and residential yard and harvesting of paddy from stubble in other time was removed with the arrival of this machine. In this case, for those who do not need to straw and its packing cost and carry it to the warehouse was not cost effective, the best and most logical work was burning!

Here, by abstract referring to descriptive and inferential statistics section of the survey and also looking at the figures and documents that were created in previous discussions, this discussion be completed and results will be provided.

Land

Most farmers (respondents) of the research are less than one hectare of rice land (0/2 to 0/9 acres) that is roughly based on official statistics. Therefore this confirms that the subsistence farming of rice in the province. In agriculture, in order to trade, all the resources and opportunities to become an economic value to be spent.

Livestock

Among the total 226 respondents, only 51 cases (22/6 percent) were kept livestock and 160 respondents were those who kept livestock in the past. Reasons such as lack of efficient livestock (171), expensive nutritional inputs (121), Obsolescence of traditional care practices (75), and lack of space for keeping livestock in residential areas due to increased construction in the village, modernism and copying of residential space in an urban community and also change in the style of living (52) are among the reasons cited in justification in keeping livestock. The statistics confirm that livestock in Guilan province, especially in plains and suburban areas is declining. Of course, traditional and old livestock method is now obsolete. And this is one of the main causes of excess of straw.

The animal place

All respondent who said that they are kept livestock (51), in making the place have used materials such as wood, cement, iron, tin and brick for building the livestock place and no one used of the straw t in its construction. In inferential statistics, a correlation was found between the burn and livestock place type. Hence the loss of used straw in building a place for livestock may account one of the causes of being surplus and thus burning it.

Poultry Place

out of 189 respondents who have claimed that they raise indigenous chickens, only 6 individuals (2/7 percent) have used of straw in making the birds place and 183 one (81/1 percent) have used of wood, cement, iron, tin, brick, and Iranit. It also like livestock place confirms being non- applied straw in subsistence of farmers. And can be one cause of burn.

Agriculture warehouse

Among the total (111) of respondents who had a farm warehouse, only one person has stated that the straw is utilized in the construction of warehouse. Also in inferential statistics with X^2 test, a relationship was found between straw burning and lacking its use in construction of agricultural storage associated with 99% confidence. It also confirms being non- applied straw in subsistence of farmers.

Build homes, furniture and ceiling coverings of rural dwellings

Among the total of 226 individuals only 1 person has expressed to interest of straw in building homes. In furniture, only 5 people have claimed that they are using a straw. And have been expressed non-functional being of furniture straw in their current living conditions, lack of production and lack of resistance and the like for not using it. None of the respondents are used straw in the roof of houses. As in the review of the documents mentioned recommended to not use of plant fibers (straw) is the requirements of the rural housing scheme. Also in inferential statistics with X^2 test and Pearson correlation coefficients and Spearman stepwise coefficients associated with 99% confidence, a relationship was found between straw burning and lacking use of straw furniture. It also confirms being non- applied straw in subsistence of farmers and may account one of the causes of being surplus and thus burning it.

Paddy harvesting practices

215 respondents (equal to 95 percent) are doing paddy harvesting from the straw by combines and 213 equal with 94 percent immediately burn straw after harvesting paddy. Also in inferential statistics the results of X^2 test and Pearson correlation coefficients and Spearman stepwise coefficients with 95 and 99% confidence show a relationship and correlation between straw burning and harvesting practice. Therefore, it was seriously claimed the evidence about the impact of entry combine on the subject of burning straw.

Visiting customer, cooperatives and

Only 18% of respondents have claimed that when harvesting paddy from the straw in the field, customers to buy straw is visiting them. 21 people have claimed that in early fall to see them for purchase and 35 ones in the winter is going to buy from them. 223 of respondents stated that had not visited from cooperatives and farmers' organizations to buy them. The same number stated that there was not visited to buy from the industry owners. 197 people have claimed that even for collecting the straw left, no one voluntarily (without getting any fee of them) refer to fields. In inferential statistics, the results of X^2 test in 94% confidence show a correlation relationship between farmer and ranchers and burning. In addition, the results of X^2 test and Pearson and Spearman correlation coefficients also confirm the relationship between two variables with 99 % confidence. So, it can be concluded that among the important causes of the coming situation in the new extraction method is lack of clients and customers when necessary. Because, many farmers has no afford to collecting and packing straw after extraction the paddy. This, according to the costs of packaging, transportation and manpower is justified.

Baler and combine

196 respondents (equal to 86/7percent) stated that their village has no baler system. There are only 26 persons who claimed such machines in the rice harvest season in the area that was brought by the migrants. 164 persons expressed uninformed from the applicants for the purchase of this device. And only 5 persons claimed to are informed of the applicants. There are 208 persons who claimed uninformed from facilities for buying baler. Just one person was informed from the facilities to buy baler. In inferential statistics, the results of X^2 test and Pearson and Spearman correlation coefficients also with 95% confidence confirm the relationship between two variables of burning straw and existing baler system. Statistics and documents of Agriculture Jihad Organization in the most ideal conditions for 88 years, however, distributed systems in the province and devices to be brought from outside of Guilan province in the harvest season, knows only 30 percent of requires funded by the province. Hence, one of the causes to burning in the current circumstances can be shortage of baler devices in the villages. Also in Combine, 213 respondents announced combines in the harvest season belong to those immigrants who come in Guilan Province in this season (from Mazandaran and Ardebil). Being present baler devices during paddy harvesting by combine is an important issue, since if the farmers also tend to pack the straw, if baler device is not present at the same time to press and packing the straw, keeping it with the possibility of rain or the influx of cattle is also very difficult. If the straw is wet because of rain, while its usage will be destroyed to feed livestock, it can also disappear its burn.

Rial value of straw

By review and interviews with experts, approximate value obtained from each hectare of rice straw was found in West and East Guilan. Harvesting practices in these two regions is different. On this basis, at minimum ground of rice plantation about 350 kg of straw equal to 0/1 acres will produce. This value is the average amount of declared value. And based on the price per straw pocket in years87, it worth at least 380 thousand to maximum 470 thousand riyals. In the maximum rice plantation field of statistical population (14 hectare), about 49 tons of straw with the Rial value between 56 000 thousand to 70/000 thousand Rials to be burned that represents a significant loss that is realized in the agricultural sector and farmers of the province.

Common time to burn

From the farmers opinion, this corresponds to mid-70s (Year 74) and has started by introducing combine with the rice harvest in the field. Farmers have said that the reasons for burning are placed in two categories:

- 1- Burning of straw to prevent the problems of its survival in the next crop year (94/2 percent).
- 2- To combat pests and diseases that may develop due to stay there (13/7 percents).

Aware of burning effects

223 persons (98/7 percent) stated that smoke from burning can pollute the air. 209 persons stated that they have already given no notice or have been not under prosecution. Also in inferential statistics, by calculating Pearson correlation coefficients with 99% confidence, there is a correlation between lacking to protest to burning from neighborhood and burning. Farmers also stated that there was not enough information, especially in negative effects as well as the amount of damages on resources and relevant solutions. 162 people have claimed that the information in this regard has not been provided.

Farmer's comments and suggestions

The reasons such as to reduce of livestock raising , expensive labor costs, low machinery (baler), deletion of main uses of straw and the like are causes to be effective in this study to determine the onset of the study. Farmers have been proposed useful suggestions for solving this problem that emphasis on increased baler devices, land leveling for ease of machines movement, providing information where the use of straw in there (livestock nutrition), straw purchases by associations and farmers cooperatives as well as industry for use in industrial production and the like.

Suggestions

The short term solution

Reduced frequent consumption and use of straw in the livestock nutrition from one hand, and increasing labor costs and wage of harvesting machinery used in rice planting and harvesting as well as shortages of straw packing machines in the province (based on statistics and evidence) has caused the farmers of the province, especially around the cities of Rasht, Some'esara, Anzali and Astara (That parts and villages of the mentioned townships is known for officials, especially Agricultural Jihad Managers of the cities) when harvesting paddy grain from the straw that necessarily take place on the fields, due to lack of need, lack of customer visiting in the same time and high costs of collecting, packaging and transporting straw to stock or residential areas attempted to burn it, because its release also makes too many problems for the next crop year. Therefore the best work and Primary Housing is to introduced villages and mentioned parts across the province to presence of actual and legal persons in the harvest season in the mentioned points and straw collection and packaging and transportation in situ or maybe purchasing it from farmers (If no opposition from farmers). Many farmers were provided for this proposal.

medium-term solution

Statistics from straw packing machines (balers) confirms that including distributed balers in the province and balers by seasonal migrants, up to 30% of the province's needs are provided at the end of 1388, it would be very suitable during the five-year plan (Plan V), number of devices needed in the province is increased through increased banking facilities between applicants, especially by encourage the organizations created including the production cooperatives, cooperative enterprises of mechanization, extension services companies , etc. that are expanding or any actual or other legal person and more importantly, creates a safe storage across the province and useful and effective information for farmers to collect and packaging and transport and storage of straw during the year and sales and supply to meet the needs of the province or maybe other states.

long-term solution

As it was in discussions, the current situation is the product of several factors. Among the most of them is to reduce its many common uses and merely use in animal nutrition. So it is essential that as many developed countries, this material and the sub-products and other products such as rice husk, which is a problem around the rice factories and may be burn used to produce industrial products that some of them were reported. From this perspective, important employment opportunities will provide for the province. In the current situation, this product is used only in livestock feed and if this case is also deleted, then there will be many other problems that should from now with creativity and innovation meet by research findings concerning the use of straw.

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