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Analysis of factors affecting on the development of the entrepreneurial spirit of farmers (A case study of rural farmers of Dehgolan) - Iran

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***Abstract*—** Descriptive- survey research aimed to analyze the factors affecting on the development of the entrepreneurial spirit of farmers among rural farmers of Dehgolan (5 villages) was performed. With using Bartlett table 205 randomly was selected as the sample. The research instrument was a researcher made questionnaire that based on literature studies, library issue was designed. Validity and content of the survey instrument was obtained with using a panel of experts (faculty members of Agricultural Extension and Education and MA degree). Cronbach, s alpha value of 0/87 was obtained by showing that represents the reliability of the survey instrument. The results showed that the entrepreneurial spirit of farmers was moderate. Four factors of previous experience and communication skills, field- infrastructure, property psychological and technical capacity 61/223% of the total variance was explained. Formation entrepreneurial training classes, inviting leading entrepreneurs, inviting investors and private companies and providing opportunities to gain experience by farmers are advised.

***Keywords*—** entrepreneurial spirit, factor analysis, farmers, rural Dehgolan.

I. INTRODUCTION

The word “entrepreneurship” is derived from the French word “Entreprendre”, it means operate, start or responsibility and guarantee [1]. In Webster dictionary the entrepreneur is someone who responsible to risk of an economic activity and organize, managing it [2].

Entrepreneurship is a valuable thing from nothing and also transforming one idea to one opportunity. It is an essence that a person have in her/his own inner and the process that leads to creativity and innovation and in fact, the engine and driving force of economic development [3].

If we know villages as agricultural and food products strategic axes that it’s need is increasing , we would sense to their unique role in development , growth and prosperity and we will understand that ignoring the contribution of rural and villages habitants will be seek costs and unpleasant consequences [4]. So, today the entrepreneurship is considered as one of the developmental tools, because the entrepreneurial men create a success form and also the entrepreneurship necessary is sensed according to high increase of new competitors and creating distrust sense to traditional methods [5].

Attention to entrepreneurship mentality among the rural population, and including farmers is one of the most important strategies of rural development. The importance of entrepreneurship in rural development is due to identify of opportunities and problems by entrepreneur person to innovate the new strategies in order to growth and development. Therefore, entrepreneurship has an important role in rural development trough creating employment, improving quality of life, appropriate income distribution and optimal usage from resources [6].

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Therefore, it has a particular importance to assess rural entrepreneurship and attempt for development and supporting entrepreneurship in rural developmental process by providing its initial fields. Consequently, the present study was done in order to analyze the affecting factors on extending and broad the entrepreneurial sense of rural farmers of Dehgelan village.

A. Theory and research history

Entrepreneurship is a process; the critical element of this process is that the entrepreneur and his / her risky work are quite interrelated [7]. The entrepreneur duty is mixing the personal characteristics – financial tools and resources available in the workplace [8]. Douglas Lober , as one of the entrepreneurship scholars , believes that three factors may led to the development of entrepreneurship , including : intra – organizational factors , external environment and personality characteristics [9] .

Personality characteristics have been studied by different individuals, reference [10] shows that emphasizes in important characteristics on entrepreneur individuals according to Karlond statements: 1. need to succeed; 2. the internal control center; 3. willing to risk taking; 4. the need for independence; 5. Creativity.

referring to human entrepreneurial school is identified the following characteristics for successful entrepreneurs:
The most of need to personal success , little need to control , self – regulation activities , belief to their own success in controlling the life results , risk – taking , high tolerance of ambiguity , high self – esteem and lack of adaptability [11] .

Some researchers also believe the predict ability of personality characteristics will be increased when the interaction between personality and circumstances have been considered [12]. What cannot be ignored is that we can be found the entrepreneur in the gravity center of entrepreneurship process, so can be expected that the entrepreneur has a significant role in the work success.

When we examine the entrepreneurial process, we realize that three essential variables involve in setting up any new business: (a) individual or individuals who are looking for entrepreneurship (b) environmental situations (c) characteristics to provided opportunities [12].

In a study know that entrepreneur's behaviors are related to their success. However, they don't ineffective factors such as organization, goals and strategies and external factors such as environment in this process. They knows important the three main characteristics such as motivation to promotion , internal control center and willing to risk – taking and five secondary features such as the need for independence , need for power , intolerance of ambiguity , need to join and perseverance for entrepreneurs [13] .

In policies to entrepreneurship referred that in order to encourage for entrepreneur should be operated at three levels: individual, firm and community [14]. Features and talents of man, finally reveal on his workplace, therefore should be considered by management and entrepreneurial researcher. But there is an important point that entrepreneurship can be taught, or at least its development and expansion is provided through education [15].

The education is an activity that it is used for transferring the knowledge and required information to setting up and business management and will be followed the attitudes , skills and abilities development of non – entrepreneurship individuals . On the other hands, entrepreneurship education can be one of the most effective ways to facilitate the transferring of graduates' population to labor market. Entrepreneurship education is increased self – confidence, motivation and energy, creativity and desirable self – efficacy among learners. No doubt, these features will have great value in persons' education [16].

reference [17] shows that an effective training program should be taught to learners how they express an adequate behavior in the form of entrepreneurship according to Ronshetad statements. So it is important to choose an appropriate content to offer it in training courses of entrepreneurship . the content of entrepreneurship courses in four different fields was examined:

1. Entrepreneurial principles and entrepreneurs features and process development and the extension of entrepreneurial concepts and also requirement of entrepreneurial attract.
2. Personal entrepreneurial skills, such as: psychological – behavioral characteristics, methods to improve creativity and ways to deal with risk - taking threats and risks.
3. Familiarity to business opportunities, training of developing the business plan, familiarity with principles of organization and management, familiarity to rules and regulations, marketing and international trade methods.
4. Business culture , including beliefs and norms prevailing business environment , developmental ways of entrepreneurial culture , new business situations in the country and the world , digital economy , business information technologies [18] .

II. MATERIAL AND METHODS

This research in terms of overall approach is quantitative and according to research objectives is descriptive – survey. Based on the research features and as the results of research can be used to increasing the effective entrepreneurial farmers spirits, this research is applied. Statistical population of research is farmers of Dehgolan rural district (five villages). Using Bartlett table 205 individuals were examined by simple random sampling.

The research tool was a researcher made questionnaire that is designed based on library studies and subject literature. Validity and research's tool content was obtained using an expert's panel consisting of faculty members of promoted field and agricultural education and major experts of this field. Cronbach's alpha test was used to measure the reliability of research tool. Cronbach's alpha coefficient for reliability of

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research tool is calculated 0.87, which indicates the proper reliability of designed scales. In order to data analysis, 17 SPSS software was used. To achieve the research objectives, descriptive statistics (frequency distribution, mean and so on) and inferential statistics (factor analysis) were used.

III. RESULTS AND DISCUSSION

The entrepreneurial mentalities of farmers were examined which its results were presented (table 1).

Table 1 – Frequency distribution the amount of farmers' entrepreneurial mentality of Dehgolan village

The amount of farmers' entrepreneurial mentality	frequency	Percentage	Cumulative percentage
At low level	72	35.13	35.13
At average level	107	52.19	87.32
At high level	26	12.68	100
Sum	205	100	

As the results of table 1 also show the most farmers have entrepreneurial mentality at average level (107 persons). So 87.32 % of Degolan's farmers have entrepreneurial mentality at low and average level. After studying the entrepreneurial mentality of farmers, the factor analysis was performed to analyze the affective factors on extension and development of entrepreneurial mentality of farmers.

KMO coefficient was equaled to 0.796. This was at good level for factor analysis. Also Bartlett test was equaled to 3963.16, which is in the level of significant percentage (table 2).

Table 2 – Extracted factors with special value of variance after factor rotation

Row	Factor	Special value	Variance percentage	Cumulative percentage
1	First	3.821	23.881	23.881
2	Second	2.794	17.462	41.343
3	Third	1.673	11.238	52.581
4	fourth	1.439	8.652	61.233

After factor rotation according to Varimax method, research variables were categorized into four factors (table 3). Generally, these four variables were estimated 61.233 % of total variance.

Table 3 - Results from factors rotation by varimax method

Factors	Structures	Factor value
Previous experiences and communication skills	1. Economic activity in children and adolescents	0.816
	2. New and innovation work	0.662
	3. Watching TV	0.753
	4. Reading newspaper	0.742
	5. Following the news	0.601
	6. Familiarity with computer	0.681
	7. Familiarity with internet	0.652
	8. Using of internet	0.650
Basis–infrastructure factor	1.The increase of services activity fields	0.703
	2. The increase of industrial activity fields	0.702
	3. The increase of agricultural activity fields	0.637

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	4. Internet access	0.625
	5. loan possibility	0.654
	6. Access to newspaper	0.665
Psychological characteristics	1.Familarity to theoretical foundations of business	0.568
	2. Start – up experience of small business	0.762
	3. Opportunities specification	0.644
	4. Marketing	0.591
	5. Risk – taking	0.635
	6. Creativity	0.623
Technical abilities	1.The ability to develop a business report	0.635
	2. familiarity to work regulations	0.535
	3. The ability to economic feasibility	0.530
	4. The ability to technical feasibility	0.522
	5. how to establish a business	0.521

Based on the results, four factor including previous experiences and communication skills, basis (field) – infrastructure factor, psychological characteristics and technical abilities are effective on extension and development of farmers' entrepreneurial mentality of Dehgolan village. Research findings have an appropriate overlap with other studies. For example reference [9] believes that three factors may led to the development of entrepreneurship, including: intra – organizational factors, external environment and personality characteristics and also reference [12] were referred to this point that three essential variables involve in setting up any new business: (a) individual or individuals who are looking for entrepreneurship (b) environmental situations (c) characteristics to provided opportunities.

It is interesting to note that the psychological characteristics of entrepreneur were obtained separately in all of these studies , So what cannot be ignored is that we can be found the entrepreneur in the gravity center of entrepreneurship process , so can be expected that the entrepreneur has a significant role in the work success [12] . Also reference [8] shows that the entrepreneur duty is mixing the personal characteristics – financial tools and resources available in the workplace.

I. CONCLUSION AND RECOMMENDATION

According to results the entrepreneurial mentality of most farmers is at average level and thus we require improving . Also according to research four factor including previous experiences and communication skills, basis (field) – infrastructure factor, psychological characteristics and technical abilities are effective on extension and development of farmers' entrepreneurial mentality of Dehgolan village, so they should be considered particularly. Thus there are offered recommendations here to improve entrepreneurial mentality of farmers:

- Holding entrepreneurship education classes through respective organizations and inviting understood individuals and experienced teachers in relation to entrepreneurship to attend a training class.
- Inviting the top entrepreneurs to attend a class and using their experiences.
- Providing adequate opportunity for farmers to achieve necessary experience through developing applicable and practical business plan and using their experiences.
- Inviting investors and private firms to participate in entrepreneurship education classes to financial support of farmers' ideas and more familiarity to area situations.

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Evaluation of morphological traits of monogerm hybrids in rhizomania infected land and its relationship with qualitative and quantitative traits for selection of resistant cultivars in sugar beet (*Beta vulgaris* L.)

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Abstract

In order to evaluate the morphologic characters of the sugar beet monogerm in the polluted field by rhizomania disease, and its relationship to the quantitative and qualitative characters and to introduce the best tolerant hybrids, a Randomized Complete Block Design (RCBD) experiment with four replicates was conducted in the Fars Agricultural and Natural Resource Center of the Fars province Iran in 2013. The 25 treatments of the trail consisted of the Foreign and native cultivars (sensitive and tolerant) and also the hybrids resulted from maternal based cross monogerms with resistant pollinator to rhizomania disease. In this experiment, the average of three Foreign cultivars: Tous, Mandarin and Isella, were considered as the control. With respect to the root and white sugar yield characters, the results showed that in spite of the SBSI 006 cultivar, by average yield of 42.6 Ton ha^{-1} which had not any significant difference with tolerant cultivars, the others had a significant difference. The (28894*28873-33)*F-8732 Hybrid had the best yield of 37.84 Ton ha^{-1} , with respect to the control tolerant cultivars, had a yield decline of 13.92 Ton ha^{-1}. The hybrids after on, (7112*SB36)*F-8737 and (7112*SB36)*F-8770, by average root yield of 37.49 Ton ha^{-1} and 36.18 Ton ha^{-1} respectively, had the least difference with the tolerant control cultivars. The Jolgeh-86 cultivar had the least root yield. The results showed a higher correlation between yield morphological characters of growth, vegetative and uniformity in this trail. Although trail of the little leaf character did not show any relationship with yield. The uniformity and well formed roots, had a close relationship with yield, so that more and well uninformed roots dad a better yield resistance. therefore, in order to produce suitable and disease tolerance cultivars, recording the morphological character during the growing season, could help the selection of cultivars and the uniformity and well formed roots in harvest time and being concerned in the field selection and production of resistant cultivars in the improvement works. The results of this study showed that none of hybrid were better than the Foreign resistant control. And therefore, are not introducible as new ones, but the three pollinators F-8738, F-8732 and F-8770, with respect to root and white sugar yiels and their morphological characters in the field, could be considered in later improvement cycle and being introduced.

Key words: Rhizomania disease, Monogerm sugar beet, Tolerant cultivars, The apparent traits and quantitative and qualitative traits.

Introduction

The rhizomania disease or the root madness, is one of the most important sugar beet disease (8). The rhizomania disease for the first time, has been reported in Italy (1955) and after on in other part of the world including French (1972), Japan (1973), America (1983) and in rest of the world (12). The biology of the this fungus, first of all, has been explained in polluted areas of sugar beet cultivation of on soils of the Germany by Keskin (1964)

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(12). Leaving the fields or the complete destruction of soils, due to the damages of this disease in these regions, it distinguishes the existence of the disease long years ago (5). Due to the severe decrease of the yield by this disease, its unlimited duration in polluted soils and uneasiness of its control which has been a sugar beet industry (1). In 1966, Kanava called this disease as rhizomania which means root madness. In 1973, Tamada and Baba, described this disease as the necrotic yellow sugar beet (Beet Necrotic Yellow Vein Virus, BNYVV), which is transferred by the fungus *polymyxa beta* Keskin.

The root madness has been reported from most of the world countries, which compared to all sugar beet diseases in more dangerous (10,11). This disease in Iran for the first time, was reported by Ezadpanah and coworkers in Fars (1996) , and the existence of this disease has been established in different parts of the country in sugar beet cultivation regions. By this information, it was opened a new horizon in sugar beet pathology, since before this, the heavy damage of the disease was attributed to the similar signs and secondary rot of fungus, nematodes and bacterial factors. At present time , the rhizomania disease have reached to the economic threshold and in many situations have caused. The deterioration and elimination of fields. In addition to the sever decline in root mass, it causes also a decline in sugar content, so that the sugar yield in hectar decreases to half or less. Its damage usually reaches to more than 30%, and in some cases reaches to one hundred percent (1,3,9).

In management of rhizomania disease , is based on the tolerant cultivars. In order to decrease the damage of rhizomania disease , it has been recommended some methods including early cultivation of sugar beet (4), pot cultivation of sugar beet (15), appropriate field drainage (7) and the disinfectation of soil by methyl bromide, but these methods were not completely effective , or not economic for rhizomania disease control. Therefore, other methods of disease control have not any role in declining the damage (16). At present time . resistance to this disease, is one of the most important way in increasing yield in agricultural crops, the utilization of this cultivar is the most effective and secure method of bioenvironmental in plant disease management (11,18)

In order to recognize the resistant germplasms, several methods has been used, one of which is field performance, that is the concerned genotypes are cultivated in the polluted fields, and based on the evaluation of disease signs, the root yield and sugar content, the tolerant genotypes are selected (13).

According to the high damage of the disease and deterioration of different fields through it, researchers in the field of cultivar tolerance level evaluation in polluted lands to rhizomania disease and finally, selection of the best and most adaptive cultivars to grow in polluted area, is urgent. The success of a tolerant commercial cultivar in polluted area, will be certained when both male and female parents are the carrier of resistance genes.

Material and method

In order to conduct the experiment, a piece of the land in the Fars Agricultural and Natural Resource Center (Zarghan City) was selected in which the pollution of field with fungus, the carrier of virus and rhizomania disease agent has been approved. Then, 25 experimental treatment including the foreign and native resistance and sensitive cultivars, and the hybrid resulted from the crosses between the bases of the maternal monogerms with the pollinators of rhizomania resistant, were cultivated in a randomized complete block design(RCBD), with four replicates. Each treatment was laid on as 3 rows of 7m length , by a distance of 50 cm in between, in a piece of land polluted by rhizomania disease, located in the Fars Agricultural Research Center (Zarghan City) of the Fars province. In this experiment, the average of three foreign cultivars of Tous, Mmandarin, and Isella were considered as the control. The protection practices include weeding, thinning and the control of pest and diseases and weeds were accomplished uniformly. For the cultivated treatments, the required records including uniformity number, growth number, leaf greenness number were used by fivefold index ,in which the 5 number was devoted to very good status and the first number to the severe condition. Rhizomania number was obtained based on the ninth fold of Luter Bakher and coworkers (2005), Zero number: without observed signs, on number: very tolerant (the main root is nearly healthy and some fuzzy root),number 3: tolerant (the main root is party plasmolized and with average fuzzy root and change color), number 5: intermediate (the main root is cupped shape, change color and the lateral roots as fuzzy), number 7: sensitive (sever fuzzy and dwarfness, destruction of main root), number 9: sever sensitive (destruction of plant). The paired numbers will be attributed to plants with intermediate single numbers. The data analysis of variance of the experiment was also accomplished by the means at probability levels of 1% and 5%, the Least Significant Difference (LSD) was applied. The mean comparison was measured based on the difference with the tolerant control cultivar.

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Conclusion

In this experiment, nearly all of the measured traits showed a significant difference at the probability levels of 5% and 1% (table 1). In which, most of the differences is observed between the hybrids and foreign resistant cultivars (table 2). Except for the SBSI006 cultivar with average yield of 42.6 ton ha^{-1} , which had not any difference with the tolerant cultivars, Others showed a high difference. The (28899*28873-33)*F-8732 hybrid, with average yield of 37.84 ton ha^{-1}, had the best yield, which compared to the control tolerant cultivar, showed a yield decline of 13.92 ton ha^{-1}. After on, the hybrids(7112*SB36)*f-8738 and (7112*SB36)*F-8770, with average root yield of 37.49 and 36.18 ton ha^{-1} respectively. Showed the least difference of root yield with the average of resistant cultivars (table2).

The Jolgeh-86 cultivar, with average yield of 12.73 ton ha^{-1} had the least root yield in the severe polluted conditions of rhizomania disease, which compared to the control cultivar had a yield decline of 40 ton ha^{-1} (table 2). It is worthy of mentioning that these differences has occurred at the highest intensity of the disease and those hybrids or cultivars certainly show tolerance and have a higher yield or are equal to the resistant control cultivar, that in safe conditions of the field will have a very suitable yield . The white sugar yield of mean of the foreign cultivar was 6.98 ton ha^{-1} , which compared to the hybrid and cultivars in this experiment, had a significant difference and were placed in a separate group. The above mentioned three hybrids along with the SBSI006 cultivar, as a suitable hybrids, had the least difference root yield with foreign cultivars, by the way, the native cultivar named as SBSI004, 005 and also suitable sugar yield which, although had not a high root yield , but with high sugar content, shows a good sugar yield. The sugar yield is the product of root yield by sugar content, which by increasing one of these component , will cause an increase in sugar yield (6). The sensitive cultivar of Jolgeh-86, by white sugar yield of 1.36 ton ha^{-1} advocate the least content (table 2). From other investigated trails it could be pointed out their morphological characters under field condition and their pollute intensity of roots to the rhizomania disease (scale 1-9). The most polluted number to this disease, was attributed to Jolgeh-86 cultivar(more than 6), and the least polluted number – after foreign cultivars-between 3 and 4 was attributed to those hybrids and cultivars which were ranked as good cultivar. In this experiment the hybrids were not better foreign cultivar, which indicate the non pure genetic resistance to the rhizomania. Also the plants which died during growing season due to this disease were recorded (table 3). With regard to the primary plant number (plant counting after thinning) , at the root number in the harvest time, the average dieback of foreign cultivars was estimated about less than 7%, and in the rest of above mentioned cultivars about 10% and in native cultivar of SBSI was 5% (table 3).

By relaying on the results of morphological character of the plants, which have rated the plots based on growth uniformity and greenness in June and August (fig 1), with five fold index (1-5), firstly, in this experiment the diversity between cultivars was very little at June and August. Secondly, the results showed a correlation between yield and morphological status of cultivar, so that the same cultivar which was better than other treatments in this investigation also had a suitable morphological character in view of growth, greenness and uniformity. Of course, investigation of little leaf character do not show any relationship , however those cultivar which had a high yield, from the view of little leaf trait, attained a lower number which indicated that it can not discusses the quantitative trait including white sugar and root yields (fig 1). Well and uniform roots have agood relation with yield (6). In this trail hybrids with more uniform root had a better yield. Therefore, to produce suitable and tolerant cultivar to disease, during growing season recording the morphological traits could be a suitable help in selection of well formed and more uniform roots in harvest time, and along with little pollution to disease could produce tolerant cultivars in the trend of improvement works. The results showed that none of the hybrids were better than foreign tolerant controls therefore are not introducible as new cultivar, but three pollinator parents F-8738, F-8732 and F-8770 in view of their sugar yield and morphological characters in the field, as the parents which can be put in later improvement cycle, to be introduced.

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Table1 Analysis of variance for quality and quantity traits of sugar beet monogerm hybrids

ms	purity	wsc	Alc	N	k	Na	sc	White sugar yield	sugar yield	Root yield	DF	SV
Mean Square												
10.23	598.96	36.13	355.36	2.33	27.43	18.27	15.64	1.91	3.14	144.29	3	Rep
0.66*	74.55**	7.23**	32.80	0.29	1.10**	4.67**	4.14*	7.76**	11.45**	328.22*	24	Var
0.34	35.63	3.24	38.75	0.33	0.33	2.06	2.04	1.15	1.76	60.47	72	Error
13.64	8.67	16.23	60.08	37.16	8.52	23.19	8.96	27.77	24.01	22.55		CV

* & **: significant at 5% and 1% level of probability, respectively.ns not significant.

Table 2: Mean of root yield and white sugar yield ($t.ha^{-1}$) of sugar beet monogerm with LSD at 5% and 1% level of probability

no	hybrid	root yield	in cors of check		white sugar yield	in cors of check	
V1	(7112 * SB36) * F-8738	37.49	-14.28	E	4.04	-2.94	E
V2	(SB37 * 28874-4) * F-8738	32.37	-19.40	E	3.37	-3.61	E
V3	(28894 * 28873-33) * F-8738	33.20	-18.56	E	2.88	-4.10	E
V4	(7112 * SB36) * F-8736	34.51	-17.26	E	3.52	-3.46	E
V5	(SB37 * 28874-4) * F-8736	29.75	-22.02	E	2.95	-4.02	E
V6	(28894 * 28873-33) * F-8736	33.08	-18.68	E	3.28	-3.69	E
V7	(7112 * SB36) * F-8732	30.35	-21.42	E	3.44	-3.53	E
V8	(SB37 * 28874-4) * F-8732	27.85	-23.92	E	3.04	-3.94	E
V9	(28894 * 28873-33) * F-8732	37.84	-13.92	E	4.22	-2.76	E
V10	(7112 * SB36) * F-8734	28.68	-23.09	E	3.03	-3.95	E
V11	(SB37 * 28874-4) * F-8734	33.44	-18.33	E	2.86	-4.12	E
V12	(28894 * 28873-33) * F-8734	32.01	-19.75	E	3.81	-3.17	E
V13	(7112 * SB36) * F-8770	36.18	-15.59	E	4.03	-2.95	E
V14	(SB37 * 28874-4) * F-8770	30.11	-21.66	E	4.04	-2.94	E
V15	(28894 * 28873-33) * F-8770	29.87	-21.90	E	3.03	-3.95	E
V16	(7112 * SB36) * F-8769	27.97	-23.80	E	2.89	-4.09	E
V17	(SB37 * 28874-4) * F-8769	31.65	-20.11	E	3.26	-3.72	E
V18	(28894 * 28873-33) * F-8769	31.65	-20.11	E	3.71	-3.27	E
V19	SBSI004	35.34	-16.42	E	4.13	-2.85	E
V20	SBSI005	37.96	-13.80	E	4.15	-2.83	E
V21	SBSI006	42.60	-9.16	C	4.63	-2.35	E
V22	Isella	64.97	13.21	A	8.39	1.41	C
V23	Tous	46.77	-5.00	C	6.64	-0.34	C
V24	Mandarin	43.55	-8.21	C	5.90	-1.07	C
V25	Jolgeh-86	12.73	-39.03	E	1.38	-5.59	E
		LSD5%	9.18		LSD5%	1.27	
		LSD1%	11.33		LSD1%	1.56	
		Check mean	51.77		Check mean	6.98	

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A: Most than check in 1%,B: Most than check in 1%,, C: no different with check, D: Lower than check in 5%, E: Lower than check in 1%,

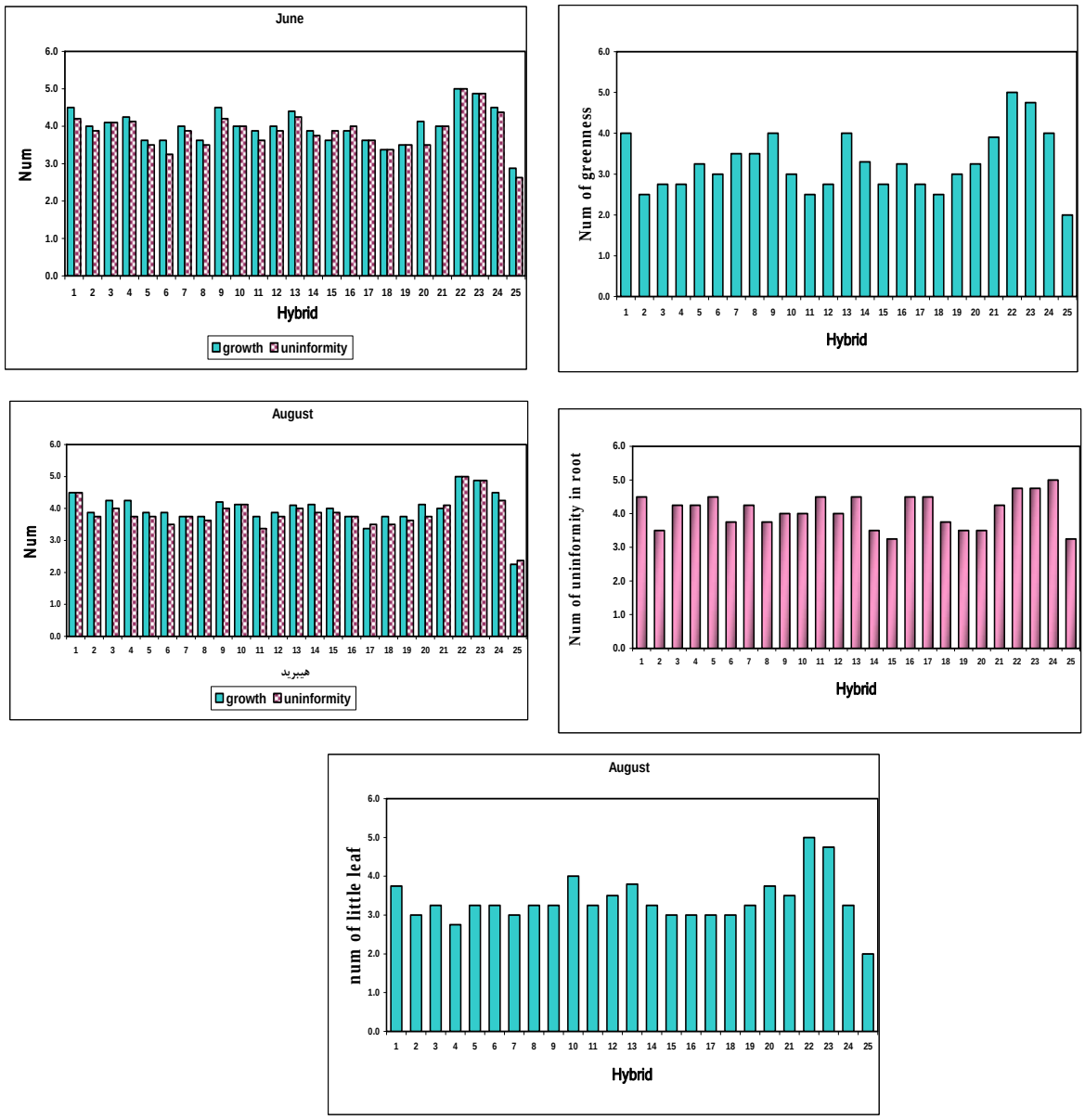

Fig 1: Morphological traits of hybrids with five fold index (1-5)

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Table 3: Mean of disease severity and root rot present during growth season

num	origin	disease severity	Root rot%
v1	(7112 * SB36) * F-8738	4	10.25
v2	(SB37 * 28874-4) * F-8738	4.75	12.61
v3	(28894 * 28873-33) * F-8738	4.75	11.48
v4	(7112 * SB36) * F-8736	4.5	2.7
v5	(SB37 * 28874-4) * F-8736	4.75	25.31
v6	(28894 * 28873-33) * F-8736	4.5	16.12
v7	(7112 * SB36) * F-8732	4	14.85
v8	(SB37 * 28874-4) * F-8732	4.5	27.65
v9	(28894 * 28873-33) * F-8732	4	10.6
v10	(7112 * SB36) * F-8734	5	18.66
v11	(SB37 * 28874-4) * F-8734	3.75	17.92
v12	(28894 * 28873-33) * F-8734	5.75	9.96
v13	(7112 * SB36) * F-8770	3.25	12.99
v14	(SB37 * 28874-4) * F-8770	4.75	25.43
v15	(28894 * 28873-33) * F-8770	4.75	24.35
v16	(7112 * SB36) * F-8769	4.5	27.63
v17	(SB37 * 28874-4) * F-8769	4.5	11.39
v18	(28894 * 28873-33) * F-8769	4.75	15.8
v19	SBSI004	4.25	17.96
v20	SBSI005	4.5	14.09
v21	SBSI006	4.5	4.49
v22	Isella	3.75	0.43
v23	Tous	3.25	5.41
v24	Mandarin	4	6.38
v25	Jolgeh-86	6.5	61.23

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Assessment of energy efficiency in agro-forestry systems of date palm and Barely (case study)

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***Abstract*—** The systems of Agro-Forestry lead to the increase of the resistance and efficiency of the resources use in agricultural production systems with the rise in biodiversity. Assessment of the energy efficiency of these systems has contributed to the energy challenges in the sector of the production of agricultural products and improves the energy productivity in these types of production systems. Hence 100 gardens of date which have the date and barley agroforestry selected randomly in the region of Sistan and Baluchestan and the data related to the input and barley pertinent to the agricultural year of 2011-2012 were obtained from the farmers in the form of the questionnaires. The results demonstrated that in the systems of agricultural forests of forage date and barely, the total energy inputs and outputs are respectively 34401.94 and 104671.28 MJ ha. Accordingly, the energy use efficiency was calculated 3.04 in this system that was about 0.9 units lower in comparison to the date monoculture system. This is due to the use of chemical fertilizers in the production of forage barley and the barley's failure to reach to the stage of seed production. The results also revealed that in forage date and barley agroforestry, a cycle between human, livestock and plant is created while the rise in biodiversity and the farmers' income. In addition to provide part of the required forage, it reduces the waste.

***Keywords*—** Agricultural forest, barley, date, energy use efficiency, Sistan and Baluchestan

I. Introduction

Due to the land extent of date gardening (Phoenix dactylifera L.) in Iran and the necessity of optimal use of the existing potentials in the region, the cultivation of plants such as forage barley in date in the format of the agroforestry is important. So it is advisable that in this cultivation system, in addition to supply part of the required fodder, plants such as barley by creating biodiversity prevents pests and disease and also increases the input use efficiency.

Agroforestry increases the crop production through a combination of annual agricultural plants with perennial woody plants or livestock on a piece of land as well as economic, cultural, environmental and cultural profits. Thrvathasan [1], Gordon and Newman [2] and James [3], observed in several experiments that in dry condition, Leucaena tree competes well in mixed cultivation with plants such as millet, sorghum, peanuts and corn. In the study of two types of agroforestry with Paulownia Tree (Pauliwaniaelongta S. Y.HU) in the north of China and Tea (Camellia sinensis) in the south of China, it was observed that the ratio of energy input to output and the economic income in agroforestry of Paulownia, increased 9.45 and 7.56 respectively, compared with the system in which there is no tree. Also the energy input to output ratio and the economic income in agroforestry of Tea had been increased 18.7 and 64.29 percent respectively, compared to the traditional system (without the system of agricultural forest) [4]. In the systems of agricultural forest, each tree has had a significant impact on ecosystem inanimate condition due to its size, rooting depth and permanent nature and involves in many interactions between organisms. Furthermore, the tree limits the water and wind erosion, provides shade and branches for the livestock, forms accumulation community, moderates the soil temperature and reduces evaporation and transpiration.

The mixture of species and the difference in the time of flowering and ripening of the fruits, cause that the crop always exists for harvesting all the year and also food resources and income are guaranteed for the entire year.

As one of the most important gardening crops in more than 30 countries around the world, the date is produced more than 4/5 million tons per year. Iran is one of the major countries in date production and produces more than 900 thousand tons of date annually [5]. The role and importance of date in the industry is noteworthy, so that in the division of agricultural products, the date is often placed among industrial plants. In Sistan and Baluchestan Province, the date annual production is over than 140 thousand tons. Farmers in the regions of Sistan and Baluchestan usually consider the spaces in the

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cultivation of date trees about six meters; this matter causes that the light does not reach to the lower layers. Because of the lack of the forage sources in these regions, plants such as barley are used for the cultivation of date and due to the climate and weather conditions of the date under cultivated areas and the lack of forage in these regions, it seems that date and barley agroforestry can lead to the combination of livestock and farming while provide the livestock forage. It also increases the use efficiency of inputs and the farmers' income and results in the higher resistance of the production ecosystems in these regions. So this research was done with the aim of the calculation of energy flow in a production system of date and barley agroforestry in the region of Baluchestan.

II. MATERIALS AND METHODS

GeoghraphicCharacteristics of the Location under Study

This research was donein Sistan and Baluchestan Province at a distance of 25 to 31 degrees north and 58 to 63 degrees east, with an area of 187502 square kilometers. The dominant climate is desert and semi-desert, the average annual rainfall is between 110 to 120 mm and the average annual temperature is between 22 and 37 degrees centigrade.

Data Collecting and the Calculation Methods

The data using in this study were collected from the gardens of dates and barley in 10 important cities of Sistan and Baluchestan. So 100 date gardens which have the date and barley agroforestry were chosen randomly in these areas and the data related to input and barley pertinent to the agricultural year 2011-12 were obtained in the form of questionnaires from the farmers. The data related to the type of inputs and the energy equivalents are shown for each group of inputs in Table1.

Table 1: Energy equivalents of different input and output values used in low input system in date palm production

Input	**Energy equivalents (MJ/ unit)**
Human labor (h)	1.96
Machinery (h)	62.70
Chemical fertilizers (kg)	
Nitrogen	60.60
Phosphorus	11.10
Potassium	6.70
Manure (kg)	0.3
Pesticides	199
Fungicides	92
Herbicides	238
Diesel-oil (l)	56.31
Water for irrigation (m^3)	0.63
Output (kg)	
Date palm	18.76

The amount of energy consumption in each group of inputs was calculated from the multiplication of the amount of the input use and its energy equivalent per unit (extracted from scientific sources). Then on the basis of input and output energy, the amounts of the energy use efficiency, energy productivity, specific energy and net energy were obtained according to the following equations:

1) Energy use efficiency = energy output ($MJ.ha^{-1}$) / Energy input ($MJ.ha^{-1}$)

2) Energy productivity = yield of wheat ($kg.ha^{-1}$) / Energy input ($MJ.ha^{-1}$)

3) Specific energy = energy input ($MJ.ha^{-1}$) / Yield of wheat ($kg.ha^{-1}$)

4) Net energy = energy output ($MJ.ha^{-1}$) – Energy input ($MJ.ha^{-1}$)

Also the share of direct energies (including man power, fossil fuels, and irrigation water), indirect (including seed, consumer chemicals, and machinery), renewable energies (man power and seed), non-renewable (fossil fuels, fertilizers and chemicals, water and machinery) was calculated [6].

III. RESULTS AND DISCUSSION

Agroforestry is the most important system of date production in the region of Sistan and Baluchestan. Farmers of this area often use annual plants such as barley and vegetables like lettuce under the palm tree for farming. The use of chemical fertilizers in the date production is not common in this area and mostly livestock manure is used. There just moldboard plow is used for earthwork operations and other cultivation operations and garden construction is done traditionally and in fighting with weeds also revertible plow is often used. Though Mozafati date is valuable economically, but due to the fairly good resistance of this kind of date against diseases, the use of fungicides is not common. The most important pest of this region is the date weevil and the farmers force to use toxins to fight with this pest. The farmers of this region choose barley as a plant along with date in a low input agroforestry due to the keeping of livestock and the lack of forage.

Table 2 shows the amounts of inputs, date performance and their energy equivalents. The total amount of inputs for the date production was about 20081.75 MJ ha in a year. On the contrary to the other production systems, the energy obtained from the chemical fertilizers was zero in this system. The amount of used livestock manure was about 12 percent of the total energy inputs. Machinery and fossil fuels was about 47 percent of the total energy inputs which was more used for earthwork operations, the transportation of livestock manure

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and the products in the farm. The consumed water was about 31.37 percent and the manpower 8.11 percent that devoted about 3.31of the total energy inputs according to the harvest by hand and other common operations in the garden was about 3.85 percent. Machinery was 1.87 percent and meanwhile the land preparation operations devoted the most amount of energy.

And eventually to combat with date weevil, the use of pesticides includes 1.48 percent of the total energy inputs. The average date performance and the total energy inputs were 4500 kg ha and 20081.75 MJ ha respectively. The amount of total energy output was 84420 MJ ha and the energy use efficiency was 4.20 in this production system.

Table 2: Energy consumption and energy input-output relationship for date palm production

Input	**Quantity per unit area (ha)**	**Energy equivalent (MJ/unit)**	**Total energy equivalent (MJ)**	**Percentage of total energy input (%)**
Human labor (h)	831	1.96	1628.76	8.11
Land preparation	96	1.96	188.16	0.93
Cultural practices	395	1.96	774.20	3.85
Harvesting	340	1.96	666.40	3.31
Machinery (h)	6	62.70	376.20	1.87
Land preparation	2.67	62.70	167.40	0.83
Cultural practices	1.42	62.70	89.03	0.44
Transportation	1.91	62.70	119.75	0.59
Chemical fertilizers (kg)				
Nitrogen	-	60.60	-	-
Phosphorus	-	11.10	-	-
Potassium	-	6.70	-	-
Manure (kg)	8000	0.30	2400	11.95
Pesticides	1.5	199.00	298.5	1.48
Fungicides	-	92.00	-	-
Herbicides	-	238.00	-	-
Diesel-oil (l)	161.22	56.31	9078.29	45.20
Water for irrigation (m^3)	10000	0.63	6300	31.37
Total energy input (MJ)			20081.75	
Output (kg)				
Date palm	4500	18.76	84420	
Energy input-output ratio			4.20	

Barley has been one of the old and common plants in this region that has a special place due to the boom in animal husbandry and the lack of forage. Due to the more resistance of barley with regard to dryness, and the less growth period and the failure to deal with high temperatures, this plant is more adaptable with Baluchestan region. On the other hand according to the small distance of date trees (6 meter) and the lack of adequate light penetration between the planting rows, it is the suitable place for the cultivation of forage plants such as barley. In a study it was revealed that barley has more energy use efficiency in comparison to wheat in Sistan and Baluchestan Province [7].

The most amount of input use in forage barley cultivation was related to chemical fertilizers, devoted 48 percent of the total

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energy input [7]. Also obtained similar results pertinent to the share of chemical fertilizers in Sistan and Baluchestan. The most amount of consumed energy in chemical fertilizer was related to Nitrogen (44 percent) and phosphorus fertilizer includes 3 percent of the total energy input. Also Fossil fuels include 24 percent, seed 15 percent, livestock manure 10 percent and work force 1.29 percent of energy input. The total energy inputs and energy outputs were respectively 15921.14 MJ ha and 20251.28 MJ ha and the energy use efficiency was estimated 1.27 (Table 3).

Table 3: Energy consumption and energy input-output relationship in barley production

Energy	**Quantity per unit area (ha)**	**Energy equivalent (MJ unit -1)**	**Total energy equivalent (MJ)**	**Percentage of total energy input (%)**
Inputs				
Human labor (hr)	105.60	1.96	206.97	1.29
Machinery (hr)	2.81	62.70	176.18	1.11
Diesel fuel (l)	70.25	56.31	3955.77	24.84
Chemical fertilizers (kg)				
Nitrogen (N) (kg)	116.31	60.60	7048.38	44.27
Phosphate (P2O5) (kg)	47.83	11.10	530.91	3.33
Potassium (K2O) (kg)	-	6.70	-	-
Herbicide (l)	-	238	-	-
Pesticide (l)	-	199	-	-
Fungicide (kg)	-	92	-	-
Water for irrigation (m3)	2541.2	0.63	1600.95	10.05
Seeds (Barley) (kg)	163.4	14.70	2401.98	15.08
Total energy input (MJ)			15921.14	
Output				
Total energy output (MJ)	1745.80	11.60	20251.28	
Energy input-output ratio			1.27	

In date and barley agroforestry the total energy inputs was equal to 34401.94 MJ ha and the total energy outputs was estimated 104671.28 MJ ha and the energy use efficiency was determined 3.01. It is considered that according to the entering of barley, the energy use efficiency fell due to the using of chemical fertilizers in barley production in this region. It was observed in other studies that the most important energy challenge in the discussion of barley production is the using of chemical fertilizers especially Nitrogen fertilizers. Like the results of this study, it was also demonstrated in the research of [8] and [9]that the Nitrogen fertilizer devoted the most amount of energy consumption among chemicals. Though Nitrogen fertilizer has a vital role in the growth and function of the plants, but has always been considered as a serious challenge in relation to energy consumption in agriculture. According to above issues it can be inferred that though the

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energy use efficiency fell about one unit with the barley enters into date production system, but in return, it increased the biodiversity and created a cyclic system between human, livestock and plant in addition to the increase in the operation and farmers' income. This matter reduces the waste while provided part of the required forage. Another reason for the decrease in the energy use efficiency was the failure of the seed production in barley that in this system just the production forage energy of barley was calculated.

The rate of energy productivity in date and barley agroforestry was obtained 0.18 (Table 4). This means that per unit energy consumption in this production system, 0.18 operation unit is obtained. The amount of energy efficiency for different plants was reported 0.06 in the resources (13), 0.10 for wheat (3), 0.19 for barley (24), 1 for tomato (11), 0.06 for cotton (40) and 1.53 for sugar beet (10). Energy productivity is almost a much more suitable parameter for the comparison of two different regions from the viewpoint of the plant production compared to energy use efficiency, because the difference in the rate of energy efficiency can be due to both the difference in energy input and function and this makes the judgment bit difficult, but the energy productivity index calculates the ratio of production operation per kilogram into energy consumption and demonstrates the difference between two areas much better.

Table 4: Energy input-output ratio in wheat and barley production.

Items	Unit	Date palm	Barley	Agroforestry
Energy input	MJ ha $^{-1}$	20081.75	14320.19	34401.94
Energy output	MJ ha $^{-1}$	84420	20251.28	104671.28
Energy use efficiency	-	4.20	1.27	3.04
Specific energy	MJ kg $^{-1}$	4.46	8.20	5.50
Energy productivity	kg MJ $^{-1}$	0.22	0.10	0.18
Net energy	MJ ha $^{-1}$	64338.25	4330.14	70269.34

The amount of specific energy and net energy in the date and barley agroforestry and the date pure cultivation was calculated 5.50 MJ ha and 4.46 MJ ha per kilogram of date (Table 4). Mohammadi reported the amount of specific energy 5.54 for wheat, 11.24 for cotton, 3/88 for corn, 16.21 for sesame, 1.14 for tomato, 0.98 for melon and 0.97 for watermelon [10]. The specific energy was the reversal of the energy productivity so its low rates reveal that less energy is used for the production of per unit operation.

The rate of direct, indirect, renewable and non-renewable energies in date gardens were obtained 84.86, 15.31, 39.48 and 48.56 percent respectively; for the date and barley agroforestry, the amounts were 61.53, 38.46, 30.63 and 62.39 respectively (Table 5). These results reveal that the share of renewable energies in date production in monoculture system was about 9 percent lower than the date and barley agroforestry that this issue reveals agriculture in Iran is too much dependent to non-renewable energies (about 87 percent) [6].

According to the results of other studies in Iran, the share of non-renewable energies in the common production of potato, greenhouse cucumber, sugar cane, barley, and pea has been reported 24.72 [11]and 78.52 [8], 89.07 [12],90.08 [13],65.61 [14], and 86.7 percent [15] respectively, which are high values.

The high consumption of non-renewable energies will reduce the energy use efficiency of the production systems because chemical production and using of machinery as the main index of common systems require high energy consumption [16]. According to the report of Moore, (2008) to achieve a sustainable system of food production, the amount of energy efficiency and the share of renewable energies should be increased in agricultural systems. Undoubtedly in present time to feed a growing world population is almost difficult and perhaps impossible without the use of non-renewable energies. But considering the environmental impacts of the use of chemicals and fossil fuels, agricultural experts will have no choice but to increase the sustainability in agriculture and the share of renewable energies in the production system. Resorting to decreased plow, using combined devices to reduce car traffic machinery, using natural fertilizers instead of chemical ones, returning remains and resorting to precise agriculture which is based on the exact consumption of inputs, are the ways that the authorities should consider in order to increase the agricultural sustainability.

Table 5: Total energy input in the form of direct, indirect, renewable energy for wheat and barley

Types of energy	Date palm		Barley		Agroforestry	
	(MJ ha $^{-1}$)	% [a]	(MJ ha $^{-1}$)	%	(MJ ha $^{-1}$)	%
Direct energy [b]	17007.05	84.68	5763.69	36.20	21169.79	61.53
Indirect energy [c]	3074.70	15.31	10157.45	63.79	13232.15	38.46
Renewable energy [d]	7928.76	39.48	4209.90	26.44	10537.71	30.63
Non-renewable energy [e]	9753	48.56	11711.24	73.55	21464.24	62.39
Total energy input	20081.75		15921.14		34401.94	

[a] Indicate percentage of total energy input.
[b] Indicates human labor, diesel and water.

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[c] Indicates seeds, chemical fertilizers (NPK), herbicide, pesticide, fungicide and machinery.
[d] Indicates human labor, seeds and water.
[e] Indicates diesel, chemical fertilizers (NPK), herbicide, pesticide, fungicide and machinery.

I. Conclusion

Totally the results of this study demonstrate that though the energy use efficiency in date production in the date and barley forage agroforestry was less than date monoculture system, but instead it increased the biodiversity and created a cyclic system between human, livestock and plant in addition to the increase in the operation and farmers' income. Another reason for the falling of energy use efficiency was the failure of barley in seed production that in this system just the forage energy of barley production was calculated. This issue is very important from the viewpoint of ecology. In this production system the energy use efficiency can be increased and the share of non-renewable energies can be decreased while much more consumption of livestock manures in barley production can be promoted. Moreover other plants such as alfalfa can be used in production systems with the increase in planting spaces from 6 to 8 meter.

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Fuzzy logic in intelligent agriculture

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***Abstract*—** Fuzzy logic is an extension of Boolean logic dealing with the concept of partial truth. Whereas classical logic holds that everything can be expressed in binary terms (0 or 1, yes or no, black or white), fuzzy logic replaces Boolean truth-values with degrees of them. Fuzzy logic permits the use of linguistic values of variables and imprecise relationships for modeling system behavior and it is a powerful concept for handling non-linear, time-varying and adaptive systems. Due to need to improving agricultural systems and increasing the farmer's income, this paper presents an overview of fuzzy logic literature, modeling techniques, applications to agricultural systems; an example expresses the steps of constructing a fuzzy logic model and discusses the strategies for improving of agricultural systems.

***Keywords*—** Agricultural forest, barley, date, energy use efficiency, Sistan and Baluchestan

I. INTRODUCTION

Professor Zadeh [1], suggested that to study natural systems mathematics of fuzzy and cloudy quantities was needed. Zadeh introduced the concept of fuzzy sets as a means for describing complex systems without the requirements for precision. By reducing the need for precision, it is possible to express more easily known qualitative relationships about complex systems. Zadeh [2], noted that this method for dealing with uncertainty would have particular applicability in soft systems such as sociology, psychology, and economics. Fuzzy logic may also be useful for descriptive systems, those that fall somewhere between hard systems and soft systems, such as biology and agriculture.

Fuzzy systems are similar to expert systems in their use of linguistic variables; they can be applied to decision support systems [3]. Fuzzy logic deals with fuzzy sets, whose characteristic is to have elements belonging to them only to some degree according to a membership function with values between 0 and 1. For example, a square drawn by hand belongs partially to the set of squares (that are pure mathematical ideas) and partially to the set of non-squares because it cannot be perfect. So a fuzzy set (A) and its complement (non-A) overlaps, because some elements can belong to both. To realize the differences between classical and fuzzy logic it is worthwhile to note that the so called Excluded-Middle laws ($A \cap$ non-$A = \phi$ and $A \cup$ non-$A = X$, where ϕ is the null set and X is the set of all the elements of the universe), that hold for classical logic, do not hold for fuzzy logic where $A \cap$ non-$A \neq \phi$ and $A \cup$ non-$A \neq X$ (Ross, 1993). A so called fuzzy rule relates fuzzy sets using conditional IF- THEN sentences like "IF Y is A THEN Z is B" where A and B are fuzzy sets. A fuzzy system is a set of fuzzy rules connecting fuzzy input and fuzzy output in the form of IF- THEN sentences [4]. For this reason, a fuzzy system represents a particular knowledge or expert system. A trivial example could be: 1) if it is hot, turn down the heater, 2) if it is cold, turn up the heater, etc. Where hot, cold, turn-down, turn-up are all concepts that can be represented by fuzzy sets. In such systems, more than one rule can fire at the same time and in parallel.

Modeling of complex systems is the final application for which fuzzy logic has been used. Some examples include predicting the seasonal demand for electric power, meeting quality control objectives with minimum cost in a wood chip refining process [5], and analyzing consumer preference data for marketing studies [6]. Zadeh although predicted that fuzzy models would find widespread use in soft systems, only preliminary investigations have begun in the social sciences.

Components of fuzzy models

In classical models variables have actual number values, the relationships are defined in terms of algebraic functions, and the outputs are numerical values (crisp). Models with fuzzy logic have variables which influence system behavior and relationships among the variables which describe the system. In fuzzy logic, the values of variables are expressed by linguistic terms such as “bad, medium, and good”, the

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relationships are defined in terms of if-then rules, and the outputs are fuzzy subsets which can be made "crisp" using defuzzification techniques. The crisp values of system variables are fuzzified to express them in linguistic terms. Fuzzification is a technique for determining the degree of membership that a value has to a particular fuzzy set. This is determined by evaluating the membership function of the fuzzy set for the value.

Membership functions

A membership function is a mathematical function, which defines the degree of an element's membership in a fuzzy set. A fuzzy subset A is defined by a membership function, $\mu_A(t)$ where is the domain of the variable on which A is defined. The value of $\mu_A(t)$ for each t determines the degree to which each element in the domain belongs to A. Although both classical and fuzzy subsets are defined by membership functions, the degree to which an element belongs to a classical subset is limited to being either zero or one. On the other hand, in fuzzy logic the degree to which an element belongs to a subset may be any value in the interval [0, 1]. as $\mu_A(t)$ for a fuzzy subset may be defined by any function, it is easy to see that a classical subset is a special case of a fuzzy subset [7]. Memberships for classical and fuzzy subsets are shown in Fig. 1.

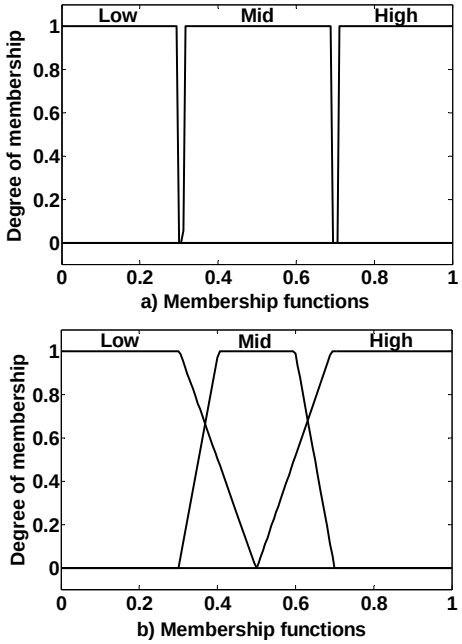

Fig 1 :(a): Membership functions for the classical sets. (b): Membership functions for fuzzy sets.

Methods for determining membership functions
Manual methods

There are a range of statistical methods for determining the membership functions. Watanabe [7] emphasizes that these falls into two wide groups: use of frequencies or by direct estimation. Put simply, the frequency approach obtains a membership function by measuring the percentage of people in a group (usually experts in a particular area) who answer yes to a question about whether an object belongs to a particular set. Direct estimation methods take a different method by asking experts to grade an event on a scale. Watanabe conducted some experiments on the two approaches and concluded that the use of direct estimation methods is the preferred way of the two. These two methods are covered by [3], considers four different methods into the acquisition of membership functions: direct rating, polling, set valued statistics and reverse rating. Many researchers have investigated more rational techniques for determining membership functions. One of these methods is fuzzy clustering. Excellent explanation on fuzzy clustering can be found in [8,9].

Automatic methods

The automatic generation of membership functions covers a wide variety of different methods. In automatic generation expert is completely removed from the process or the membership functions are 'fine tuned' based on an initial guess by the expert [10]. Use of modern soft computing techniques (neural networks and genetic algorithms) have been used recently.

Fuzzy rules determination

Many researchers have investigated techniques for determining rules, and expert knowledge is the one most commonly used. The expert is asked to summarize knowledge about the system in the form of a cause and effect relationship. From these the rules are formulated [11,12]. discuss another method of fuzzy rule determination based on fuzzy clustering techniques.

Another way to discover rules are fuzzy classifier systems that are generalizations of genetic classifier systems. A genetic classifier system uses some of the ideas from genetic algorithms to develop expert systems [13]. Standard genetic algorithms have also been used to discover rules. Artificial neural networks have also been used to learn rules as well as membership functions [14,15,16].

Fuzzy operator

For fuzzy subsets to be useful in modeling there must be a way to define relationships between them. This is accomplished with logical operators and inferences. Logical operators can form a new subset from two or more existing subsets. There are three basic operators in fuzzy logic, which are analogous to the Boolean operators: union or OR, intersection or AND, and negation or NOT. The most common definition for these three operators are:

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{AND: $A \wedge B = \min(\mu A, \mu B)$, OR: $A \vee B = \max(\mu A, \mu B)$, NOT: $A = 1 - \mu A$}
A more discussion of fuzzy operators can be found in [6].

Fuzzy inferencing
Fuzzy inference is the process of formulating the mapping from a given input to an output using fuzzy logic. The goal is to obtain a conclusion consisting of one or more consequents from a premise consisting of one or more antecedents. The mapping then provides a basis from which decisions can be made, or patterns discerned. The process of fuzzy inference involves all of the pieces that are described in the previous sections: membership functions, fuzzy logic operators, and if-then rules. There are two types of fuzzy inference systems that can be implemented in the Fuzzy Logic Toolbox: Mamdani-type and Sugeno-type. These two types of inference systems vary somewhat in the way outputs are determined. References to descriptions of these two types of fuzzy inference systems can be found in the bibliography [17].
Fuzzy inference systems have been successfully applied in fields such as automatic control, data classification, decision analysis, expert systems, and computer vision. Because of its multi disciplinary nature, fuzzy inference systems are associated with a number of names, such as fuzzy-rule-based systems, fuzzy expert systems, fuzzy modeling, fuzzy associative memory, fuzzy logic controllers, and simply (and ambiguously) fuzzy systems. Since the terms used to describe the various parts of the fuzzy inference process are far from standard. Mamdani's fuzzy inference method is the most commonly seen fuzzy methodology. Mamdani's method was among the first control systems built using fuzzy set theory. It was proposed in 1975 by Ebrahim Mamdani as an attempt to control a steam engine and boiler combination by synthesizing a set of linguistic control rules obtained from experienced human operators. Mamdani's effort was based on Lotfi Zadeh's paper on fuzzy algorithms for complex systems and decision processes [2].
Mamdani-type inference, in Fuzzy Logic Toolbox, expects the output membership functions to be fuzzy sets. After the aggregation process, there is a fuzzy set for each output variable that needs defuzzification. It is possible, and in many cases much more efficient, to use a single spike as the output membership functions rather than a distributed fuzzy set. This is sometimes known as a singleton output membership function, and it can be thought of as a pre-defuzzified fuzzy set. It enhances the efficiency of the defuzzification process because it greatly simplifies the computation required by the more general Mamdani method, which finds the centroid of a two-dimensional function. Rather than integrating across the two-dimensional function to find the centroid, we use the weighted average of a few data points. Sugeno-type systems support this type of model. In general, Sugeno-type systems can be used to model any inference system in which the output membership functions are either linear or constant.

Defuzzification
The desired output of a fuzzy model is often not the fuzzy subset. Once the rules have been composed the solution, as has been seen, is a fuzzy set. However, for most applications there is a need for a single action or "crisp" solution to emanate from the inferencing process. This will involve the "defuzzification" of the solution set. There are many techniques for defuzzification, such as Defuzzification can be performed by several methods such as: center of gravity, center of sums, center of the largest area, first of the maxima, middle of the maxima, maximum criterion and height defuzzification. Of these, center of gravity (centroid method) and height defuzzification are the methods commonly used [18]. All of the techniques try to find the expected value from a probability distribution and differ only in their technique of estimating the probability distribution from the fuzzy subset [6].

II. APPLICATIONS OF FUZZY LOGIC IN AGRICULTURAL SYSTEMS

The challenge of the precision approach in agricultural systems is to equip the farmer with adequate and affordable information and control technology [19]. Yang [20],used fuzzy logic to categorize weeds recognized with image processing in a precision farming process.
In recent years, more and more applications of fuzzy theory to agriculture have been reported: [21] applied fuzzy control for electro hydraulic steering systems for agricultural vehicles. The adoption of this fuzzy controller can significantly reduce the time and costs in the design of steering controllers for agricultural vehicles. Shahin et al [22] used Fuzzy logic model for predicting peanut maturity. They developed a fuzzy model to predict peanut maturity based on NMR-signal (FIDPK) and days after planting (DAP). Chao et al [23] used a neuro-fuzzy based image classification system that utilizes color-imaging features of poultry viscera in the spectral and spatial domains was developed for this approach. Combining features of chicken liver and heart, a generalized neuro-fuzzy model was designed to classify poultry viscera into four classes (normal, airsacculitis, cadaver, and septicemia). The classification accuracy was 86.3% for training and 82.5% for validation. Singh et al [24] used fuzzy logic for Autonomous robotic vehicle development for greenhouse spraying. Chao et al [25] used fuzzy logic controller design for staged heating and ventilating systems. Lacroix et al [26] used Fuzzy set-based analytical tools for dairy herd improvement. to predict the yield for precision farming [27] , to predict corn breakage [28], to manage crop production [29], to reduce grain losses from a combine and to manage a food supply [30]. Simonton [31] and Chen and Roger [32], used FL in the classification of plant structures. They found good agreement between the results from fuzzy prediction and human experts. Binoy Alias

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and Mujumdar [33], used fuzzy rule based model for estimate agricultural diffuse pollution. Verma [34], developed a fuzzy decision support system (DSS) to aid decisions related to quality sorting of tomatoes. Some other examples of reported fuzzy logic applications includes a model to predict the effects of multiple stresses on tree growth, predicting right soil moisture for land preparation [35], feeding strategies on large dairy farms [36], and grading beef quality [37]. Canning et al [38], developed a fuzzy logic controller for autonomous forest path navigation. Ruimei et al [39], used fuzzy evaluation for the aquaculture pond water quality. The method can provide decision support for water management to the fishery farmers. Sewilam et al [40], used fuzzy modeling for performance assessment of irrigation systems. Nabila et al [41], used application of fuzzy neural techniques in fault detection and isolation of single failures in greenhouses. Lameck et al [42], used application of fuzzy-neural network in classification of soils using ground penetrating radar imagery. Classifications of uniform plant, soil, and residue color images were conducted with fuzzy inference systems by Meyer et al., [43]. Mogens [44], Presented new methods for classifying soil map delineations using the EM38 sensor and fuzzy logic. Mirabbasi et al. [45], used Mamdani Fuzzy Inference System (MFIS) as a decision support system to classify Irrigation water quality. Simonton [31], used a fuzzy method to classify plant structures; he found good agreement between the results from fuzzy prediction and human experts. Verma [34], developed a fuzzy decision-support system to aid decisions for sorting the quality of tomatoes. Yang et al. [20], showed the feasibility of image processing and fuzzy logic control in the development of a precision farming herbicide application system. Mazloumzadeh et al. [46], used the Mamdani fuzzy inference system (MFIS) to evaluate and classify alternative date harvesting machines in the Iranian date harvest industry. The results obtained with MFIS showed an 85% agreement with those obtained by an expert. Mazloumzadeh et al. [47] , used the Mamdani fuzzy inference system to classify date palm trees based on some physical properties related to precision agriculture. Papageorgiou et al. [48], used Fuzzy cognitive map based approach for predicting yield in cotton crop production as a basis for decision support system in precision agriculture application. The main advantage of their approach was its simple structure and flexibility, representing knowledge visually and more descriptively. Li et al., [49], used some management zones for site-specific management in precision agriculture based on five soils and landscape attributes, including a NDVI image, soil electrical conductivity, total nitrogen, organic matter and cation exchange capacity. Fu et al., [50], used the fuzzy clustering algorithm optimized by particle swarm optimization (PSO) to delineate management zones. The delineation result indicated that fuzzy clustering optimized by PSO had a good performance on delineating management zones and variable fertilization management was feasible in their study area. Yang et al., [20], developed a precision herbicide-spraying system in a corn field. Simulations using different fuzzy rules and membership functions indicated that the precision spraying has potential for reducing water pollution from herbicides needed for weed control in a corn field. Ferraro et al., [51], developed fuzzy logic-based and field scale indicators to evaluate the effects of pesticides and tillage on agro ecosystems. The type of analysis carried out in this study using farm-level variables may help find more sustainable ways to manage agricultural inputs. Jaradat et al., [52], developed a new intelligent agriculture controlled environment based on a fuzzy logic system for frost protection in an open field environment by using a smoke generator or burner and a set of distributed wireless sensor nodes. Ferraro [53], developed a knowledge-based system (KBS) for assessing soil condition in agro ecosystems. The KBS developed in this work provided an alternative modeling tool for assessing agro ecosystem condition when knowledge regarding long-term assessment is imprecise and uncertain. Delgado et al., [54] Used fuzzy data mining to evaluate survey data from olive grove cultivation to help decision-making in the field of olive cultivation in Andalusia. However, their work was applicable to other geographical areas and to other kinds of crops. Srivastava et al., [55], used a fuzzy neural technique to Forecasting of rainfall using ocean-atmospheric indices and results showed the best performance for the forecast of the monthly August rainfall in India. Study of Bragato [56], explored the applicability of the fuzzy c-means approach to conventional soil surveys for detailed land use assessment with the purpose of taking into consideration the fuzziness of data collected in areas where soil type transitions are not easily observable on the surface. Li et al., [49], developed a hybrid fuzzy-stochastic water-management (FSWM) model for agricultural sustainability under uncertainty, based on advancement of a multistage fuzzy-stochastic quadratic programming (MFSQP) approach. The results obtained can help decision makers to identify desired water-allocation schemes for agricultural sustainability under uncertainty, particularly when limited water resources are available for multiple competing users. Kolhe et al., [57], developed a novel approach of rule promotion based on fuzzy logic for drawing intelligent inferences for crop disease management. Yan et al., [58], used adaptive neuro fuzzy inference system for classification of water quality status. Cohen et al., [59] showed the advantages of fuzzy-based dynamic soil erosion model (FuDSEM) over the other two models in evaluating the relative distribution of erosion. Based on the growing evidence from the literature showing successful use of fuzzy logic for modeling, DSS and controls, it appears that applications to agricultural systems are inevitable.

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III. EXAMPLE

In this section we will go through an example of the construction and operation of a simplified fuzzy model to predict date palm tree yield as a function of tree age and tree bunch number. The first step is to develop a descriptive understanding of the system and obtain data containing a range of values for age and bunch number and the resulting of the tree yield. From data we can determine the appropriate operational range (universe of discourse) for each variable we can define membership functions using the techniques discussed in Section 2.1.2. Fig. 2 illustrates assumed membership functions for the selected independent and dependent variables.

Next we determine the relationships between the variables and express those using linguistic rules. The rules can be determined using expert knowledge, clustering, or one of the other techniques.

The results are a set of rules. Rules describe the relationships of variables. The value of tree production which results from the combination of tree age and tree bunch number values appears in the following.

Date palm tree age = A, Tree bunch number = B and Tree production = C

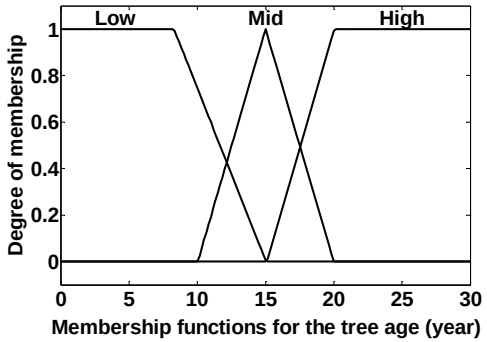
If A is Low and B is Low then C is Low, If A is Low and B is Mid then C is Low

If A is Low and B is High then C is Low, If A is Mid and B is Low then C is Low

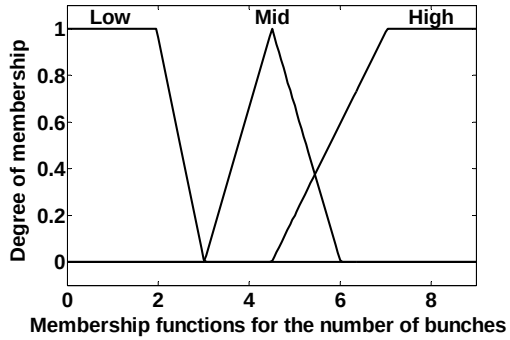
If A is Mid and B is Mid then C is High, If A is Mid and B is High then C is High

If A is High and B is Low then C is Mid, If A is High and B is Mid then C is High

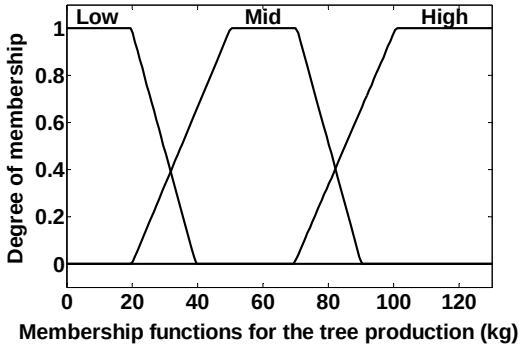
If A is High and B is High then C is High



(a)



(b)



(c)

Fig 2: Assumed sets of membership functions for the date palm variables including: (a): tree age (b): palm tree bunch number and (c): date palm production

After the values for tree age and tree bunch number are input into the model, the rules are assessed using Max-Min inferencing in Matlab fuzzy toolbox software. For this example tow input, one output Mamdani fuzzy rule-based system can be used to evaluated tree production. Based on considered membership functions for inputs the Mamdani fuzzy rule based system has 3*3=9 rules. In the applied system intersection, union, aggregation, implication and defuzzification are considered min, max, max, min and centriod respectively.

IV. DISCUSSION

Some cases of the application of fuzzy logic in agricultural systems were reviewed and also application and performance of the models in each case were introduced. Some general conclusions from application of fuzzy logic in agricultural systems can be drawn from the applications.

Grading and classification using fuzzy logic is always successful and may be better than conventional approaches, as shown by Simonton [31], Nakamishi et al., [37], Chen and Roger [32], Chao et al,. [23], Verma [34], Lameck et al., [42], Meyer et al., [43], Mazloumzadeh et al.,[46,47], Alavi et al., [60].

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Management and improvement of of agricultural systems offers many opportunities for application of general purpose empirical models, as shown by Lacroix et al., [26], Edan et al., [36], Ben-Abdennour and Mohtar, [30], Shahin et al., [61], Ruimei et al., [39], Ferraro et al., [51], Nabila et al., [41], Cohen et al., [59], Ferraro [53], Mi et al., [62], Kolhe et al., [57].

Agricultural water quality evaluation, as shown by Sewilam et al., [40], Ruimei et al., [39], Mirabbasi et al., [45], Li et al., [49], Srivastava et al., [55], Yan et al., [58], Alavi et al., [60].

Precision agriculture as shown by Simonton [31], Ambuel et al., [27], Yang et al., [20], Li et al., [63], Mazloumzadeh et al., [47], Fu et al., [50], Papageorgiou et al ., [48].

Control (Robotics, Automation, Tracking) and management of agricultural systems offers many opportunities for application of general purpose empirical models. This technique is particularly useful for agricultural machinery and food systems, as shown by Chao et al .,[25], Qiu et al., [21], Singh et al., [24], Canning et al., [38], Jaradat et al., [52].

Decision Support Systems as shown by Verma [34], Ruimei et al., [39], Li et al., [49], Delgado et al., [54], Papageorgiou et al., [48].

Prediction and estimation, as shown by Thangaradivehu and Colvin [53], Zhang et al., [28], Binoy Alias and Mujumdar [33] .

V. CONCLUSION

The nature of agricultural systems creates the need for modeling systems that are robust, noise tolerant, adaptable for multiple uses, and are extensible. Fuzzy logic has these characteristics and is being examined for use in control and modeling in agricultural systems. Fuzzy logic provides a methodology for describing complex systems using qualitative relationships in a manner analogous to quantitative equations. Non-linear, time-varying, adaptive systems are too complex to be accurately represented using conventional methods.

Briefly fuzzy logic applications in agricultural systems include:

Grading and classification, management and improvement, agricultural water quality evaluation, precision agriculture , control (Robotics, Automation, Tracking) and management, decision support systems, prediction and estimation, pattern recognition (Image Processing, Machine Vision), information systems, fermentation process, photosynthesis, food quality, soil properties for trafficability, bioengineering, economics, social behavior, and a variety of other complex systems.

The key benefits of fuzzy design are:

Simplified and reduced development cycle

Ease of implementation

Can provide more "user-friendly" and efficient performance

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Assessment of forest roads construction standards in *Arasbaran* region, Iran

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***Abstract*—**Sustainable management of forest roads depends on regular and timely forest road maintenance. Road inventory is the first step in forest road management. The purpose of this study was to assess existing roads standards by road inventory and using the results to schedule maintenance operation. To do this a part of the road network from *Kaleibarchay* watershed in *Arasbaran* forest was inventoried, and cross sectional components and existing culverts were measured and compared to standard ones. Road components were analyzed in ArcGIS$_{9.3}$ software. The results showed that there were significant differences between existing parameters and standard ones and the exceptions were side ditch depth and roadbed. Road segment only had one culvert. Cross-slope has the highest consistency with standard values. This research can be used in maintenance operation for the studied roads and also as a model to roads monitoring in the study region.

***Keywords*—**Construction standards, *Arasbaran* forest, forest roads, road inventory

I. Introduction

Forest roads are essential infrastructure and prerequisite in management of forested areas [3]. Roads as the infrastructure have a key role in forest organization, utilization and transportation of products, services, and maintenance [11]. In the non-normative design and construction of roads, forest destruction and lack of sustainable production would be likely. Therefore in planning and construction of forest roads reduction environment destruction of forest by road construction should be considered [3]. Forest roads can have many different applications, and function depending on the function type and condition of forest. The roads provide numerous benefits to forest managers and the public, but can have adverse effects on water quality, aquatic ecosystems, and other resources [8]. Therefore, forest manager should have special attention to regular monitoring and maintenance of forest roads for sustainable performance of road network. Road standard depends on use and the amount of useable wood per unit area and also the field conditions. The thickness of graveling, density, gradient, cross-slope, distance between culverts, diameter of culverts, appropriate depth, width of ditches, and other factors can prevent adverse effects and road destruction that causes the much costs. Reduction in road cross profile dimensions causes reduction of standard, roads plan speed and safety, and unnecessary increasing of dimensions causes forest ecosystem destruction [4]. Therefore the standard dimensions must properly be regarded in a sustainable forestry system. In order to monitor and control the forest road condition, considering construction standards, deficiencies, the necessity of road maintenance operation, the amount, and also exact location of this operation, statistical methods can be used. Therefore the basis for the development of road maintenance plan is a thorough understanding of the road system, its characteristics, and its needs. This is accomplished by inventorying of the road network [10]. Road inventories are valuable tools for prioritization of road maintenance and watershed restoration. They are probably one of the least expensive tools applied to the road maintenance and restoration. Therefore the important first step in forest roads management is the inventory [9]. Due to the construction of roads by constructors, providing a method for controlling the standards of construction, determining the location and estimating the volume and amount of operation should be possible. Therefore provide a scientific and appropriate method based on work volume and cost for controlling the construction standards and controlling the existing roads can be appropriate and efficient tool to management of these roads.

The purpose of this study is assessment of construction standards and obtains required information for road inventory to attain a practical and scientific method based on work volume and cost to work quality control of roads construction and maintenance constructors. Finally can be manage the existing roads by obtain required information that this case is main purpose of this research.

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II. LITERATURE

Nosrati Nasrabadi (1995), in a study surveyed qualitatively and quantitatively *Shafaroud* road network and concluded that the road network has good standard and mediocre quality. Also achieved lake of proper function performance of maintenance in all the way and less attention to the construction of technical buildings in these roads.

Puya (2006), in her study surveyed the construction standards of a branch *Namkhaneh* road network and concluded that among measured components only gradient, upper width of ditch, left and right shoulder the road network have the highest consistency with standard and 100% of the culverts distance are non-standard.

Mostafa (2007), in a study in *Kurdistan*, the North forest roads construction standards that are proposed with the aim of timber production, compared to rural roads and concluded that these roads do not have forest roads standards.

Majnounian *et al.* (2010), monitored *Namkhaneh* payment road network of the *kheiroud* forest in terms of cross and longitudinal profiles standards and concluded that traveled way width and ditch depth are corresponding to standard in different assessments. The average of turn outs and culverts distance are not corresponding to standard in the entire segment and almost all the way have proper gradient whereas only 9% of samples have proper profile and standard cross-slope.

III. MATERIALS AND METHODS

A. The study region

Arasbaran region is located in the Northwest of country and North of Eastern *Azarbaijan*. The most forests of area are located in the four watersheds of *Kaleibarchay, Eelgnechay, Hajelrchay and Celenchay*. This research is done in part of *Kaleibarchay* watershed (Fig. 1). Kaleibarchay watershed is located in the geographical location of 46˚ 40′ to 47˚ 13′ E and 38˚ 39′ to 39˚ 9′ N [2]. The average annual rainfall in this region is 600-400 mm. Average annual temperature is variable from the lowest height (the margin of *Aras* River) to high mountains and from 5 to 17˚C respectively has been obtained. The soil type in forested districts is forested brown soil and calcareous brown soil. These soils types are located on difficult calcareous rock material, marn, and sandstone [1].

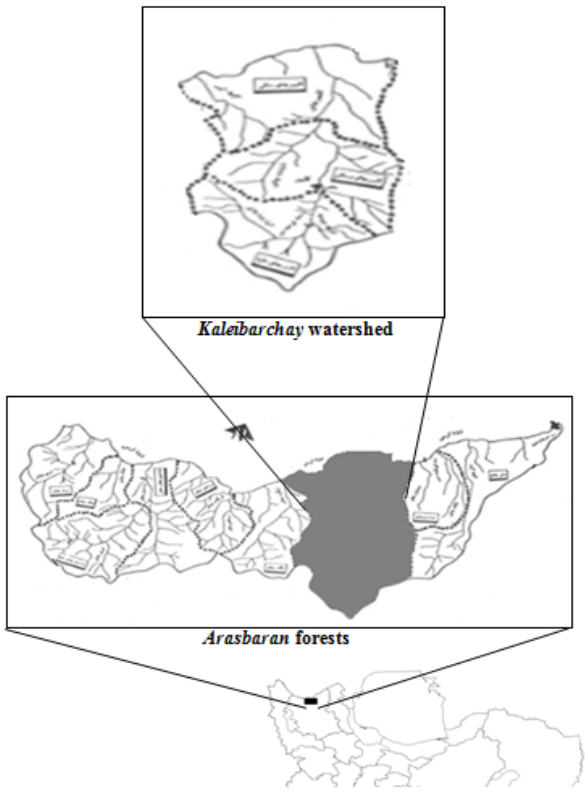

Fig. 1 position the study region in *Arasbaran* forests

B. Sampling design and data collection

First, a segment with a length of 13100 meters of the road was selected as a representative of the total forested area. Sampling method was systematic random and the starting point was selected randomly. Then other samples were determined with a distance of 100 meters from previous sample [4]. Totally 131 samples were selected and their location were marked using a consumer-grade GPS (Garmin Colorado 300). In each sample some data such as road gradient, traveled way width, roadbed width, cross-slope, shoulders width, height and slope of cut and fill slopes, ditch depth, and upper and bottom parts of ditch were collected. Diameter and the distance of culverts along the road were also determined.

C. Analysis of data

One Sample t-test was used to investigate differences between the characteristics of road and the standard values. Forest roads profile standards required in this study were obtained from 131 Journal of Management and Planning Organization. The measured data were surveyed in terms of the statistical parameters and also were stored in ArcGIS as spatial database and were analyzed.

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IV. RESULTS AND DISCUSSION

A. Evaluation of standards

The results of standard comparisons with average of obtained values are shown in Table I.

Table I road components comparison with standard quantities

Cross sectional components	Average ± standard error	Standard value	p-value
Traveled way (meters)	2.53 ± 0.05	3.5	0.000*
Roadbed (meters)	5.58 ± 0.11	5.5	0.492 ns
Right shoulder (meters)	1.26 ± 0.06	0.5	0.000*
Left shoulder (meters)	1.63 ± 0.09	0.5	0.000*
Ditch depth (meters)	0.35 ± 0.02	0.35	1.000 ns
Ditch small base (meters)	0.36 ± 0.03	0.3	0.046*
Ditch large base (meters)	1.17 ± 0.06	1	0.000*
Slope of cut slope (percent)	66.99 ± 2.76	100	0.000*
Slope of fill slope (percent)	58.05 ± 1.68	80	0.000*
Height of cut slope (meters)	2.14 ± 0.13	1	0.000*
Height of fill slope (meters)	2.3 ± 0.11	4	0.000*

* Indicative of significant difference at the 5% level
ns Indicative of no significant difference at the 5% level

According to the results, there were significant differences between existing parameters and standard ones and the exceptions were side ditch depth and roadbed ($p<0.05$).

B. Assessment of road components in terms of the statistical parameters

Road measured components were surveyed in terms of some statistical parameters and the results are presented in Table II.

Table II road components in terms of the statistical parameters

Measured components	Average	Variance	Standard deviations	Standard error	Range
Gradient (percent)	7.49	22.48	4.74	0.41	0 – 20
Cross-slope (percent)	2.53	4.56	2.14	0.19	0 – 10
Traveled way (meters)	2.53	0.32	0.57	0.05	1.9 – 5.9
Road bed (meters)	5.58	1.66	1.29	0.11	2.8 – 9.1
Right shoulder (meters)	1.26	0.54	0.74	0.06	0.2 – 3.7
Left shoulder (meters)	1.63	1.08	1.04	0.09	0.2 – 5.7
Slope of cut slope (percent)	66.99	686.75	26.21	2.76	20 - 130
Height of cut slope (meters)	2.14	1.56	1.25	0.13	0.5 - 6
Slope of fill slope (percent)	58.05	278.15	16.68	1.68	20 - 100
Height of fill slope (meters)	2.3	1.18	1.08	0.11	0.4 - 6
Ditch depth (meters)	0.35	0.02	0.13	0.02	0.2 – 0.7
Ditch small base (meters)	0.36	0.02	0.14	0.03	0.15 – 0.6
Ditch large base (meters)	1.17	0.08	0.28	0.06	0.6 – 1.9

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According to the results, the average of the gradient, cross-slope, roadbed, and ditch depth in the studied roads are corresponding to standard values 3 – 8 percent, 2 – 4 percent, 5.5 meters, and 0.35 meters respectively and most of components have a wide range.

C. Existing culverts in segment

Along the road only one culvert with a diameter of 55 centimeter was observed that this diameter is corresponding to standard value (0.4-1 meter).

D. Data analysis using ArcGIS

The results of the road components have been shown in Table III.

Table III situation rate of road component to percent

Cases the related to road components	percent
Allowable gradient	41.22
Allowable cross slope	51.14
Standard traveled way	0.00
Standard roadbed	0.76
Standard right shoulder	5.38
Standard left shoulder	2.34
Slope of standard cut slope	7.78
Height of standard cut slope	16.67
Slope of standard fill slope	3.06
Height of standard fill slope	8.16
Existence lack of cut slope	31.30
Existence lack of fill slope	25.19
Existence of side ditch	18.32
Standard ditch depth	4.17
Standard ditch small base	29.17
Standard ditch large base	37.50

According to the results, the cross-slope and traveled way had the highest and lowest rate of standard respectively.

Nosrati Nasrabadi (1995), surveyed qualitatively and quantitatively *Shafaroud* road network, but the results of this study was provided qualitative entirely. Puya (2006), surveyed the construction standards of a branch *Namkhaneh* road network and but the results of this study was provided qualitative entirely. Mostafa (2007), the North forest roads construction standards that are proposed with the aim of timber production, compared to rural roads locating in *Kurdistan* province and concluded that these roads do not have forest roads standards. Therefore this was not reasonable comparison and is not corresponding to the results of this study. Majnounian *et al.* (2010), surveyed *Namkhaneh* payment road network of the *kheiroud* forest that in this study traveled way width and ditch depth are corresponding to standard in different assessments and almost all the way have proper gradient whereas only 9% of samples have proper profile and standard cross-slope. Thus, the results of this study are corresponding to the results of present study.

The results survey of the studied roads showed that construction standards of these roads are based on forest roads standards. In the studied roads the results of the comparison road component to standard values showed that ditch depth and roadbed are corresponding to standards.

The average of gradient, cross-slope, roadbed, and ditch depth in studied roads are corresponding to standard. Therefore gradient, cross-slope, roadbed, and ditch depth of these roads are better than other components.

Application of technical buildings in these roads is not in good condition. The road segment only had one culvert with 55 centimeter diameter that this diameter is corresponding to standard (0.4-1 meter). Therefore, lack of enough culverts and in regular intervals is cause of impairment in drainage and trill of water on roads and finally cause of increase in the road surface erosion. Also the mentioned condition increases the volume and speed of water in ditch, which results in the erosion of ditch.

The results showed that the cross-road of the road is better than other components. 51.14% of the road cross-slope was standard and more than 50% of non-standard slopes are less than the standard level (2-4 percent). In region without non-standard slope (more than standard value) slope correction is needed to immunize the road for drivers otherwise due to centrifugal force the driver safety, especially in time of snow and ice is in danger. 41.22% of road gradient is standard and more than 50% of non-standard slopes are more than the standard level (3-8 percent). Since the road gradient correction is much costly, the only way can be just focusing on emendation and stabilization of road to reduce road deprecation. Therefore, the slopes that are more than the standard value, due to high erosion, the foam of the road can be modified with ditch dam or asphalt, and for slopes which are less than the standard value, by doing some excavation and consecutive positive and negative slopes and adding extra drainages negative condition can be lessened. On cut slope, 7.78% of road had the standard slope, and 16.67% had the standard height and more than 50% of non-standard sections were in terms of height more than standard and in terms of slope less than standard. In non-standard parts mechanical correction or biological stabilization or the both can be used. On fill slope, 3.06% of road was standard in terms of slope and 8.16% was standard in terms of height and more than 50% of non-standard sections were less than standards in terms of both height and slope. Therefore, for non-standard sections biological stabilization or mechanical correction can be used. Some of road sections did not have cut slope and fill slope

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therefore in these sections more attention should be paid to the use of longitudinal and transversal drainages. The traveled way of road was non-standard, and width of the most parts was less than standard value. Only 0.76% of roadbed width was standard and 50% of non-standard parts were more than standard value and 50% of others were less than standard value. According to the results, 5.38% of road right shoulder and 2.34% left shoulder were standard. More than 50% of non-standard sections of shoulders were more than the standard value. This situation can occur due to the use of bulldozer in forest roads construction, especially on ridges perpendicular to the road route that typically create excavation profiles. Heavy excavations on these profiles due to technical and administrative limitations of bulldozer, which is not capable to displace the extra side cast, leads to extra fill at the same place and increase of road width in the valley and as a result increase in the width of the road on valley side. Construction of forest roads using bulldozer due to need to maneuver area relatively high and not having enough control of bulldozer on sidecast and displacement of this material, is possible as limited construction ability and maintain the standards of the road. Today in the developed countries, excavator is used to construct the forest roads, which is an environmentally sound method in road construction [4]. According to the results, 18.32% of road route had trapezoidal ditch and 4.17% of this percentage had the standard depth and 29.17% had the standard small base and 37.5% had the standard big base. The other parts were non-standard, from which 50% had the deeper ditch than the standard value and the rest had shallower ditch. In more than 50% of non-standard sections of big and small base were more than the standard values.

I. CONCLUSION

According to the results of this research, construction standards of these roads do not have significant difference to roads standards of North Country. The results of this study showed that despite the massive costs spending on planning and construction of this network is not given much attention to the maintenance and cause loss of primary massive capital. In order to manage the forest roads, regularly and constantly monitoring of road networks is an inevitable necessity for the conservation and maintenance of existing roads. The results of this study can be used as a pattern for forest road network monitoring and would have practical application for the studied area itself. Also the results of this study can be used for planners and managers of forest roads as the pattern of roads monitoring and periodic conservation and maintenance of existing roads.

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Effect of different levels of salinity and nitrogen fertilizer on MDA accumulation and RWC content of two wheat cultivars at anthesis stage

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Abstract — In order to study the effect of different levels of salinity (N) and nitrogen on some biochemical reactions of two wheat genotypes at anthesis stage, an experiment was performed under greenhouse conditions at the Agricultural, Medical and Industrial Research School of Karaj in 2011. Treatments were five levels of salt stress (0, 6, 8, 10 and 12 dS/m), two nitrogen levels (50 and 150 Kg N/ha) and two wheat cultivars, Bam (resistant) and Tajan (susceptible to salt stress) arranged in randomized complete block design with three replication. Results indicated that under salinity stress condition, N application (150 kg N/ha) increased the RWC and also decreased the MDA content of both genotypes. The positive effect of high nitrogen level on salt-tolerant genotype was more obvious than sensitive genotype. In conclusion genotypic differences between two cultivars, from viewpoint of tolerance to salinity stress and also fertilizer permeability between two genotypes caused that effect of augmentation of fertilizer utilization on Bam cultivar be more obvious than Tajan cultivar. These results demonstrate that nitrogen could be as a physiological solution to improve wheat tolerance against salinity harmful damages at anthesis stage.

Key words— Salinity, Nitrogen, RWC, MDA, Wheat

I. INTRODUCTION

Salinity is one of the world's major environmental stresses that severely influence on crop yields, especially in arid and semi-arid areas. It is considered as kind of threat to agriculture and the soil. It is expected that the salinity of arid and semiarid regions of the world would have damaging effects. In plants under salt stress, imbalance of nutrients can occur in many ways. Salinity may affect the usability of some nutrients, absorption, transmission, or distribution of nutrients within the plant and makes it difficult or impossible to activate the physiological role of nutrient intake, and results in increase of the plant nutrient inherent need [4]. There are two forms of nitrogen including inorganic and organic nitrogen in plants. This element combine with carbon, hydrogen, oxygen and in some cases with sulfur .There is nitrogen in the structure of amino acids, amino enzymes, nucleic acids, chlorophyll, alkaloids, and purines. Although inorganic nitrogen can accumulate the form of nitrate (NO_3^-) in the stem and the plant conductive tissues but there are more abundant organic nitrogen, in most protein large molecules in plants [6].One of the most important of nutrients that its absorption can be influenced under salinity conditions is nitrogen. Salinity reduces nitrogen uptake by plants and it's an important factor that decreases growth of plants [5]. Heydari et al. [2] also found that large quantities of salt reduces the absorption of nitrogen in wheat plant. Studies of interaction of salinity and nitrogen (in soils that are deficient of nitrogen) have shown that adding nitrogen has improved growth and yield of many crops such as wheat, alfalfa, barley, beans, carrots, tomatoes, corn, clover, beans, millet and rice when there wasn't too severe salinity [2]. Results of many reports have shown that environmental stresses cause the production of oxygen radical species in chloroplasts and other organelles plant. These oxygen radical species damage the cell by oxidation of lipids, proteins and nucleic acids. keshavarz [3] reported that nitrogen absorption is reduced under saline conditions for many

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reasons (such as reducing the permeability of plant roots, reducing soil microbial activity and subsequently reduction of inorganic compounds, decreasing nitrate absorption by supply of high chlorine anion in the environment of root growth and ultimately reducing nitrification activity in the soil), consumption of more nitrogen could partially compensate for this problem and cause increase the crop yield of wheat. Thus the purpose of this experiment is study of effects of salinity stress and different levels of nitrogen fertilizer on physiological and biochemical changes including relative water content, malondialdehyde and evaluating relation between quantity of fertilizer and syntheses and decomposition of these components under salinity stress for increasing tolerance to salinity at anthesis stage.

II. Methods

The experiment in a completely randomized design with three replications in greenhouse at the Agricultural, Medical and Industrial Research School of Karaj was conducted. Treatments included two varieties of wheat (Tajan (salt-sensitive) and Bam (salt tolerant) and five salinity levels (control (3/1), 6, 8, 10 and 12 dS/ m) and two levels of nitrogen (75 and 150 kg nitrogen per hectare). nitrogen fertilization added to form ammonium sulfate and duration two initial stages of planting and 5-leaf stage., six seeds of each variety planted in pots and in the third-fourth leaves stage - were sparse to four bush in per pot. then according to the molar ratio of 10 to 1 of two types of salts, sodium chloride and calcium chloride were used to prepare solutions of salt . At anthesis stage some samples were obtained from the last developed leaf for biochemical analyzes. MDA content is as an index of lipid peroxidation that measured in the way of Turkan et al. [9]. Well as the relative water content (RWC) measured by selecting the youngest developed leaf below the flag leaf of each cultivar and in each replication. All data analyzed by MSTAT-C software and mean comparisons were analyzed by Duncan multiple range test 5% and 1% levels, and the method. Figures were drawn by Excel software.

III. Conclusions and Recommendations

As shown in Figure 1 in Bam cultivar, the largest amount of RWC saw in control and the application of 150 kg nitrogen per hectare and the lowest mean of this attribute is observed within the salinity level of 12 dS/ m and fertilizer level, 75 kg N/ha; The application of 150 kg N /ha caused increase the relative water content in this cultivar (Bam) in salinity of 12 dS/m but shows no statistically significant difference between this treatment and the control (Fig. 1). The plant requires more nitrogen to obtain a RWC much more in high salinity. Also it was observed that the lower nitrogen level in this stress level (12 dS/m) amount of RWC is reached to the lowest value. Bam cultivar is able to maintain osmotic adjustment mode to salinity of 12 dS/Mat anthesis stage or in other words, is compatible with its surroundings. As a result Bam cultivar could maintain RWC and tissues water potential by increase of nitrogen level. So resistance cultivars could moderately stable amount of RWC under high salinity [1]. In Tajan cultivar RWC reached to the most amount in salinity level of 10 dS/m and fertilizer treatment of 150 kg N/ha. That only had a statistically significant difference with salinity level of 8 dS/m and nitrogen treatment of 75 kg N/ha. In other hand this treatment (salinity level of 8 dS/m and nitrogen treatment of 75 kg N/ha) with salinity level of control and fertilizer level of 150 kg N/ha were in a same statistically group (Figure 1). In Tajan cultivar minimum relative water content was observed in salinity of 8 dS/m and nitrogen level of 75 kg N/ha that didn't have significantly difference with none of the fertilizer regimes of 75 kg N/ ha and the control treatment. (Fig. 1). Tajan cultivar was not able to utilize aforementioned way in high salinity levels and showed the maximum amount of RWC in salinity of 10 dS/m. It signifies that this cultivar was able to prevent disruption of osmotic balance. As regards, in both cultivars, the highest values of this trait in aforementioned salinity levels were observed in second level of nitrogen fertilizer; thus nitrogen was able to be effective on maintaining water and preventing leakage of cytoplasmic solution to Apoplast by increase and strength of compounds consisting of nitrogen in membrane. And this caused conservation of the osmotic balance and increased RWC. As can be seen in Figure 2, in Bam cultivar in all salinity levels application of 150 kg N/ha decreased MDA content and the lowest amount of this trait appeared in salinity of 8 dS/m and fertilizer treatment of 150 kg nitrogen per hectare that this treatment with the control (salinity levels) and nitrogen level of 150 kg N/ha were analyzed at the same statistical group. It also saw in Tajan cultivar but MDA content significantly increased in comparison with the control in salinity of 12 dS/m and fertilizer level of 75 kg N/ha. This is corroborator of being more sensitive to salinity Tajan cultivar compared with Bam so that in Bam cultivar in aforementioned treatment (salinity level of 12 dS/m and 75 kg N/ha) was observed an insignificantly increase in MDA content in comparison with the control (Fig. 2). The absence of MDA accumulation increase in resistant cultivars may be due to increased activity of the antioxidant enzymes under stress conditions

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subsequently scavenging of radical oxygen species and especially the peroxide (H2O2) and ultimately harm reduction on membrane is observed. It reported that damage on membrane is as a result of peroxidation arising from MDA accumulation that could cause the photosynthetic pigment reduction and reduce carbon fixation ability of chloroplasts [7]. Also reported that plants fed with nitrogen, decrease MDA accumulation under salt stress, reduce the nitrogen-containing compounds it may be due to concentration of compounds consisting of nitrogen [8]. Higher amounts of nitrogen have a positive impact on the integrity of cell membranes and on its constituent compounds such as proteins and lipids, and these amounts also affect on synthesis of enzymes can prevent harmful and destructive effects of salinity and further MDA production.

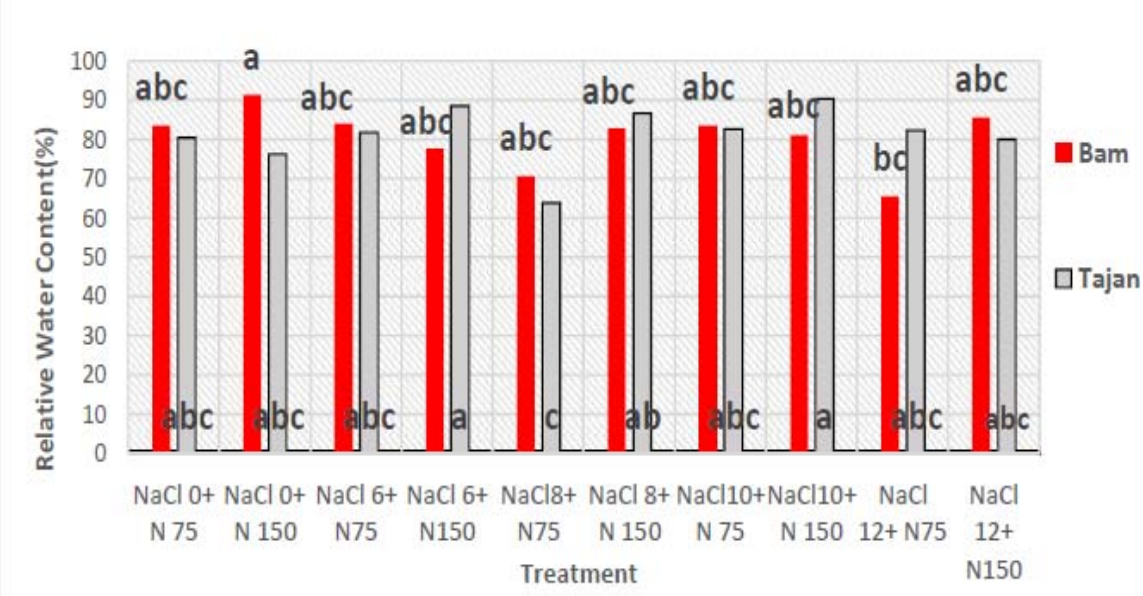

Fig. 1 Interaction of different levels of salinity and nitrogen fertilizer on wheat RWC at anthesis stage

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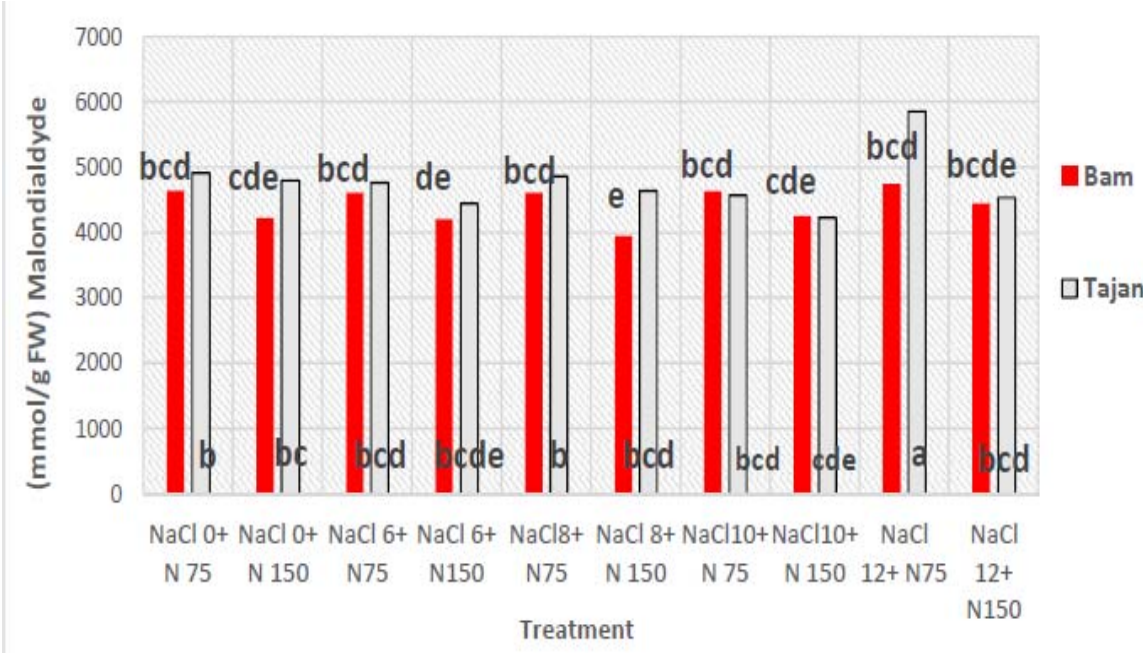

Fig. 2 Interaction of different levels of salinity and nitrogen fertilizer on wheat MDA content at anthesis stage

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