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ROLE OF DRY BEAN LANDRACE WOMEN PRODUCERS ON CONSERVATION OF PLANT GENETIC RESOURCE IN MIDDLE KIZILIRMAK VALLEY REGION OF TURKEY

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Turkey is one of the few countries with favorable climatic and environmental conditions that keep the rich biodiversity and biodiversity. The most important problem encountered together with progress in agriculture is genetic erosion. For this reason, many countries are developing policies for the prevention of genetic erosion and work for the conservation of genetic resources and sustainability of their production through these policies. Within these policies, women constitute one of the important target groups. The role of women in the protection of genetic resources and the access of many local populations to the present day is indisputable. This study was conducted to evaluate role of women in Turkey through the enterprises that grow dry bean landraces in terms of the conservation of genetic resources, and production and ensuring the sustainability of landraces. For this purpose, the data obtained from the questionnaire survey conducted with 140 enterprises that are growing the Dry Bean Landraces (DBL) on 8 provinces located in Middle Kızılırmak Valley and the roles of women in these enterprises are presented. As a result, it has been determined that in the production of dry beans, where human labor is heavily used, women are particularly effective in harvesting and selecting / cleaning seeds. Reasons such as flavor, taste, cooking time being in the first place in preferring DBL production is accepted as an indication of how effective women are in the sustainability of DBL. Agricultural extension activities to women in agriculture is necessary to providing conservation of genetic resources.
Keywords: Agricultural extension, genetic resources, women, rural development, Turkey.

INTRODUCTION

Genetic resources are important in the continuity and sustainability of agricultural production. There is no country that builds an externally dependent agricultural sector and creates an externally dependent development model in rural areas. In the development that took place within the rhetoric of development, it was ensured that endogenous development models based on local dynamics and even sustainable development models based on local dynamics were highlighted (Walsh, 2007) and in this framework evaluation of local information and varieties have created an opportunity for both rural and agricultural development (Remmers, 1995; Muehlinghaus *et al.*, 2001; Çetin, 2007; Kan *et al.*, 2017). The important thing is to evaluate this opportunity in a way that does not disturb the balance within the triangle of environment, genetic resources and development.

Within the developing and modernizing agriculture sector in the globalizing world, with each passing day modern reclaimed productive varieties take their place in production, and producers are in the initiative to provide maximum individual benefit through the input and production techniques used. Together with modern and specialized enterprises get more space in the system as the most important result of the growth; one of the most important elements is the maximization of individual utility. All phenomena attributed as traditional are now far from appealing to all segments, they have become the production sense for the luxury consumption of rich individuals. In this environment, local products and local varieties have a very limited share in total production, and mass-batch production, modern technology, chemical input and high efficiency have found more room in today's production system. In this process accelerating with the Green Revolution, the erosion of ecosystem and habitat under the pressure of modernization triggers genetic erosion and leads to the loss of our existing plant and genetic resources (Brush *et al*., 1995; Van de Wouw *et al*., 2009; Akhalkatsi, 2015; Kan *et al*., 2016; Morgounov *et al*., 2016).

Many factors mainly such as political, economic, social and cultural factors are influential in the protection and sustainability of genetic resources, (Eyzaguirre *et al*., 2004; Kan *et al*., 2016). It is stated in many studies in the world and Turkey that the local populations called village populations are mostly remote from the main centers at high altitudes with the production aim of meeting the need of the family, and their production and protection are done by producer with a high average age and rich food cultures by traditional farming systems (Harlan, 1975; Thurston, 1992; Brush, 1995; Meng, 1997; Gurung and Vaidya, 1998; Kruzic and Meng, 2006; Kan *et al*., 2017, Kan, 2018).

Another important factor in the protection of genetic resources and agricultural biodiversity is women. The

importance of women in the agricultural production system is an undeniable fact. In fact, although women are pronounced as assistant to men in agricultural production, they play a major role in the sustainability of production in small family businesses and gain more importance in ensuring sustainability in agriculture and even in the family. Today, women play an important role in unwillingness of young people to stay in rural areas or even deal with agriculture. The agricultural sector, which is seen as low status, is not preferred by the young population because of the reasons such as the risks involved in sector, the difficulties experienced in production, social security problems and even in many cases the low income per unit labor force, etc. However, in many studies, it is indicated that women have a very important role in the provision, protection and sustainability of genetic diversity and agricultural production (Swaminathan, 1998; FAO and IPGRI, 2002; Gururani, 2002; Padmanabhan, 2004; Abdelali-Martini *et al.*, 2008; Çelik, 2014; Riasat *et al*., 2014; Sood *et al*., 2015; Kan *et al*., 2016; Naqvi *et al.*, 2016; Kan *et al*., 2017). In rural areas, women play a decisive role in the management of seeds and plants for landscaping and home gardens, men are taking responsibility in remote areas. Hence, it can be said that men and women have different ecological knowledge and responsibilities (Chambers and Momsen, 2007; Bishokarma and Amir, 2014). The fact that women have specific knowledge of plant varieties used in cooking and use these plants for different purposes is effective in the decision to protect or not to protect the plant varieties (Krishnapillai, 2004).

Turkey, though it is not their homeland, is an important area for many vegetable species diversities. One of them is bean that have arrived in Turkey in the 17th century and is a plant that is well-adapted to grow everywhere in the country (Bozoğlu and Sözen, 2007; Sözen *et al*., 2018). In this study, the role of women in the use, production and sustainability of dry bean, which is one of the major field crops type for Turkey in terms of the use in human nutrition and the nutrients it contains, has been demonstrated through an empirical study. In addition, proposals have been made on the place of women in policies to protect genetic resources and ensure the sustainability of local varieties.

MATERIALS AND METHODS

***Data and Study Area*:** The some material of the study consists of the data obtained through a questionnaire survey conducted with 140 DBL producers from a total of 8 provinces (Ankara, Aksaray, Çankırı, Kayseri, Kırıkkale, Kırşehir, Nevşehir, Sivas) in the Middle Kızılırmak Valley within the scope of "Middle Kızılırmak Valley Morphological and Molecular Characterization of Local Dried Bean Populations and Determination of Genotypes Resistant to Root Nematode and Socio-Economic Characteristics of Cultivators" Project, which is numbered as TAGEM / 16 / AR-GE / 55, supported by the R&D Projects Program of the General Directorate of Agricultural Research and Policy (TAGEM) of the Ministry of Agriculture and Forestry (MoAF) (Fig. 1). The separate questionnaire forms from the project and in-depth interviews with women (generally wife of household head) were performed to collect extra data and used in the study.

The lack of a specific database belonging to producers of landraces (called as rural populations) in Turkey, makes it difficult for sampling for studies with DBL manufacturers. For this purpose, interviews with Provincial/District Ministry

Figure 1. The map of survey area

of Agriculture and Forestry Directorates experts, Agricultural Chambers and local residents have been effective in determining the DBL producers from total 8 provinces in the Middle Kızılırmak Valley designated as research area. A survey study was conducted with 140 producers who producing DBL at the determined areas according to the results of these interviews.

The questionnaires created within the survey study were developed in order to demonstrate both the general structure of the surveyed agricultural enterprises and the role of women within these enterprises in DBL production, and the questionnaires were structured for the purpose (Patton, 1987). For this reason, some results consist of data obtained from the in-depth interview (Yıldırım and Şimşek, 2008).

In the labor force calculations, the calculation was made according to the gender and age of the individuals in the family using the conversion coefficients of the Man Labor Power Unit (MLPU) For this purpose, the following coefficients have been used to transform the labor force into MLPU by sex and age (Table 1).

Table 1. Male labor power unit (MLPU) conversion factors.

Age	Sex	Coefficient
0-6	Male-Female	0.00
7-14	Male-Female	0.50
15-49	Male	1.00
15-49	Female	0.75
50-+	Male	0.75
50-+	Female	0.50

Source: Açıl and Demirci, 1984.

Likert type 5 Attitude Scale was used to measure the attitudes of producers in this study. In the Likert Scale used, positive and negative sentence structures were formed as equal number such as "1. Has Never Been Effective","5. Very effective" (Köklü, 1995).

Chi-square analysis was used in the analysis of two or more categorical responses such as "Yes-No" collected from the survey area by the questionnaire method. The "chi-square" analysis method is a widely used one, especially in the field of social sciences. "Chi-square" analysis method is divided into two main groups as "Chi-square conformity test" and "Chi-square independence test" according to the way of presentation of the data (Çömlekçi, 2001; Kesici and Kocabaş, 2007). In this study, "Chi-square independence test" was used to determine the independence of the two variables.

Here $\chi^2_{calculated}$ is given as;

$$\chi^2_{\text{calculated}} = \sum_{j=1}^{c}\sum_{i=1}^{r}\frac{(\text{Observed}_{ij} - \text{Expected}_{ij})^2}{\text{Expected}_{ij}}$$

and degree of freedom (df) given as

df = (number of rows-1) (number of columns-1)
(Kesici and Kocabas, 2007).

The agricultural enterprises were divided to 2 groups. The first group was called as *"Garden Type DBL Producers-(Garden-Type)"* who are producing DBL mostly for household consumption in very small land. The second group was called as *"Field Type DBL Producers-(Field-Type)"* who are producing DBL for both household consumption and trade in bigger than 0.1 ha areas. All the analyses were done according to the division as Garden-Type and Field-Type.

If at least one of the variables is ordinal, "Linear-by-Linear" test was used to determine the linear relationship. The "Linear-by-Linear" test is for ordinal (ordered) categories and assumes equal and ordered intervals. The Linear-by-Linear Association test is a test for trends in a larger-than-2x2 table (MIT, 2018). T Test comparing the average of the variables, was used for independent continues variables. Levene's Test was used to assess the equality of variances for a variable calculated for two or more groups (Ergun, 1995; Buyukozturk, 2012). If the parametrical tests were not suitable, then Mann Whitney U non-parametrical test for independent two variables was utilized (Duzguneş *et al.*, 1983).

In the study, Binary Logistic Regression (BLR) analyze was used. BLR was used to analyses the influence of each explanatory variables (Table 2), which are belonging to the agricultural enterprises, on the dependent variable, which is a dichotomous variable (DBL Producing type as Garden-Type and Field-Type) (Gujarati, 2003). The logit model is written;

$$\text{Prob}\,(y=1) = \frac{\exp(\propto +\beta_1 X_1)}{1+\exp(\propto +\beta_1 X_1)} = \frac{e^{\propto+\beta_1 X_1}}{1+e^{\propto+\beta_1 X_1}}$$

where Prob (y=1) is once again the probability of the event, α is the Y intercept, β_s are regression coefficients, and X_s are a set of predictors. α and β_s were typically estimated by the maximum likelihood (ML) method.

Table 2. Variables Using Binary Logistic Regression Model.

Variables	Explanation
Prod_Type ***(Dep. Var.)***	Production Type (1: Garden Type, 2: Field-Type)
Women	The Women Share in DBL Production (%)
Altitude	Altitude (m)
HH_Age	Household Leader Age (Year)
Area	Total Agricultural Enterprise Production Area (Ha)
S_Security	Social Security (1:Social Security (Other), 2: Social Security (Farmer))
Educ	Education of Household Leader (Year)

RESULTS AND DISCUSSION

When studies on the production of landraces are examined, it is now seen that landraces have left their places with the

reclaimed variety due to low yield (Newton *et al*., 2010; Jaradat, 2012; Kan *et al*., 2017). It is seen that in the face of this situation described as genetic erosion; the populations that continue to be grown are produced with the aim of eliminating the family need in areas that are not very suitable for agricultural production or in the areas of non-commercial forms like garden farming. In this case, the cultivation of such populations is based on traditional farming systems which are more labor intensive systems (Harlan, 1975; Thurston, 1992; Brush, 1995; Meng, 1997; Gurung and Vaidya, 1998; Kruzic and Meng, 2006; Kan *et al*., 2017, Kan, 2018). For this reason, in the production of landraces which is based on the family labor, the number of individuals in the family and the total number of Man Labor Power Unit (MLPU) are as important as the existence of land.

The total amount of land cultivated by DBL producing enterprises in the area of study is 27.69 ha in 2016 and it is determined that 79.66% of which is composed of dry agricultural land. 2.79% of the total production land is allocated to DBL production, and 37.86% of the production is made for household consumption in very small land like garden-type while 62.14% of production is made in field-type bigger than 0.1 hectare. When Table 3 is examined, it was determined that the enterprises dealing with the garden type DBL production are smaller enterprises than the enterprises dealing with the field type DBL production and this difference is statistically significant as a result of the T test analysis. In general, 6 out of 8 provinces in the research area are located in TR7 region at Level 2 according to the Classification of Statistical Region Units (NUTS) (TURKSTAT, 2014). The TR7 region is called Central Anatolia Region and has larger enterprises which are larger than the "6.97 ha enterprise range" per registered enterprise according to the Ministry of Agriculture and Forestry's (MAF) Farmer Registration System of the year 2017 (MAF, 2018). In a study conducted in the TR71 region, which is a sub-region of the TR7 region, the operating range is specified as 10.1 ha consisting of 5 parcels on average (AHİKA, 2013). In the study area, it was determined that the self-estates of garden-type DBL producing enterprises are below the average regional operating size (Table 3).

Table 3. Some descriptive statistics for land asset of DBL producers.

	Production Type			t-Value
	Garden	Field	Total	
Private Irrigated Area (Ha)	1.22	4.52	3.27	-2.65***
Private Rain-fed Area (Ha)	7.62	10.63	9.49	-1.44
Private Total Area (Ha)	8.83	15.15	12.76	-2.14**
Rented Total Area (Ha)	8.66	16.29	13.40	-1.38
Shared Total Area (Ha)	0.51	2.77	1.91	-1.61
Production Area (Irrigated) (Ha)	2.06	7.92	5.70	-3.47***
Production Area (Rain-fed) (Ha)	15.94	26.23	22.33	-1.72*
Production Area (Total) (Ha)	18.00	34.21	28.07	-2.64***
DBL Production Area (Irrigated) (Ha)	0.05	1.15	0.73	-4.49***
DBL Production Area (Rain-fed) (Ha)	0.00	0.08	0.05	-2.25**
DBL Production Area (Total) (Ha)	0.05	1.23	0.78	-4.85***

* Statistically significant at 90% confidence level, ** Statistically significant at 95% confidence level, *** Statistically significant at 99% confidence level

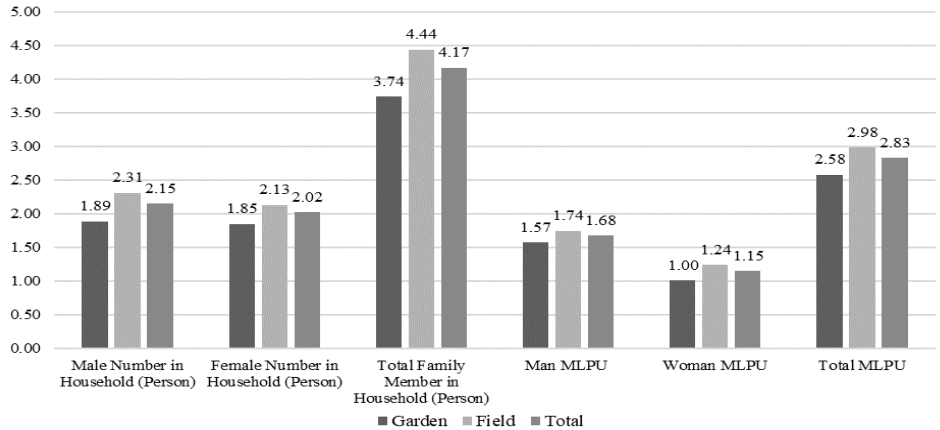

Figure 2. **Demographic features of the dry bean landraces producers by production types (%).**

It was determined that the average household size is 4 persons in enterprises dealing with DBL production (Figure 2). In particular, the low number of households may create a negative production pressure for the products based on intensive human labor, such as dried beans. In the region, it is stated that in recent years, dry bean production has decreased due to the fact that it is based on human labor during harvest while the production of chickpeas has increased because it is suitable for machine-harvesting. For this reason, labor force is more important than the number of households in the family. While MLPU per enterprises was calculated as 2.83, it was determined that statistically there is no significant difference in the MLPU asset between garden and field type DBL farmers (t value: -1.68, p: 0.095). The family labor force of field type DBL producers is more, and 41.61% of the total MLPU is provided by female.

Women have an important place in both selection and production of landraces, as well as providing cultural continuity by making local dishes based on the products obtained. Especially in rural areas in Turkey, home garden agriculture of vegetable in front of the house with the aim of meeting the need of the family is a major effort and the main manager of this effort is woman. This kind of work is mostly done for home necessities rather than commercial ones, and for this reason, quality, taste and healthy production are more important issues then yield. Table 4 shows the roles of women and men in the production process. When Table 4 is examined, it is seen that the share of work between men and women changes statistically significantly according to the garden type and field type DBL production. Especially in garden type cultivation, the use of female labor force stands out more. It appears that women are actively involved in DBL producing, especially in harvesting and seed cleaning as well as in hoeing and sowing. The fact that women are active in seed cleaning and sowing, shows that women are the decision makers in the selection of seeds to be sowed and this reveals the impact of women on the maintenance of genetic resources in the countryside.

There is a difference in the number of female employees between garden-type and field-type enterprises. According to the results of the statistical analysis, Women MLPU increase is an important criterion for the enterprise to switch from garden-type production to field-type production. Especially garden-type DBL producing enterprises, it is seen that the woman is working intensively in DBL production and the main responsible of the production. In the research area, 37,86% of enterprises are garden-type DBL producers, and such enterprises are more important for the continuity of genetic resources. Since such enterprises produce without commercial anxiety, production decisions are not affected by changing market conditions and price changes. Binary Logistic Regression Analysis was used to investigate the factors affecting the formation of the operating types. When Table 5 is examined, it is seen that with the increase of female participation in DBL production, the probability of being garden-type increased by 0.946 times. From here, it is seen that women are more involved in production in garden-type enterprises. It can be said that women who play an important

Table 4. Role of women and men in DBL production.

		Production Type			T Test
		Garden (%)	Field (%)	Total (%)	
Land Preparation	Male	87.04	98.88	94.39	-3.28***
	Female	12.96	1.12	5.61	
Sowing	Male	41.51	83.53	67.39	-7.20***
	Female	58.49	16.47	32.61	
Irrigation	Male	63.33	91.69	80.12	-4.52***
	Female	36.67	8.31	19.88	
Hoeing	Male	33.10	47.60	42.05	-2.48**
	Female	66.90	52.40	57.95	
Plant Protection	Male	66.47	98.81	89.49	-3.85***
	Female	33.53	1.19	10.51	
Fertilization	Male	69.32	95.69	84.31	-4.18***
	Female	30.68	4.31	15.69	
Harvesting	Male	31.60	42.56	38.36	-2.01**
	Female	68.40	57.44	61.64	
Seed Cleaning	Male	34.69	62.98	52.69	-4.30***
	Female	65.31	37.02	47.31	
General	Male	51.50	74.31	65.55	-5.99***
	Female	48.50	25.69	34.45	

*Statistically significant at 90% confidence level, ** Statistically significant at 95% confidence level, *** Statistically significant at 99% confidence level

Table 5. Binary Logistic Regression Results.

Variables	B	S.E.	Wald	df	Sig.	Exp(B)
Women	-0.056	0.012	21.098	1.000	0.000	0.946
Altitude	-0.003	0.001	12.455	1.000	0.000	0.997
HH_Age	-0.029	0.024	1.474	1.000	0.225	0.971
Area	0.002	0.001	3.017	1.000	0.082	1.002
S_Security	-0.047	0.470	0.010	1.000	0.921	0.955
Educ	0.019	0.089	0.045	1.000	0.832	1.019
Constant	7.602	2.235	11.572	1.000	0.001	2002.160
-2 Log likelihood			123.952			
Cox & Snell R Square			0.352			
Nagelkerke R Square			0.478			

role in seed selection in garden-type enterprises make important contributions in the continuity of genetic resources and formation of diversity.

In the performed analysis, the signs of all variables are in an agreement with the observations in the field; and especially in between the high altitude establishments, the probability of being DBL production in Garden-Type is higher. While the probability of being Field-Type DBL producing enterprise is increased as the production area of the enterprise increases; the age, educational status, social security existence of the head of households are not statistically significant variables in determining the type of operation (Table 5).

The role of women in the protection of local varieties is an indisputable fact. As seen in Table 3, in the DBL production phase, women are making significant contributions to production. Especially in home garden type production, women are the main decision-makers in seed selection and care. In the continuity of local populations, the flavor and the taste of the product, the food culture of the individuals in the family are among the leading reasons for the consumption of the product in the household. When the age of household head and their spouses is examined in the interviewed group, it is determined that they are over 50 years old (Male: 54.26; Female: 50.44). When looking at levels of education, men have a better education level than women; besides that, it has been determined that the level of education of women in home garden type DBL producing enterprises is much lower than men (Linear by Linear Association: 4.092 p: 0.043) (Figure 3).

Dry bean farming is a production activity that requires intensive labor force use. In the research area, one of the most important reasons for the cultivation of these varieties by DBL-producing enterprises is that these populations are

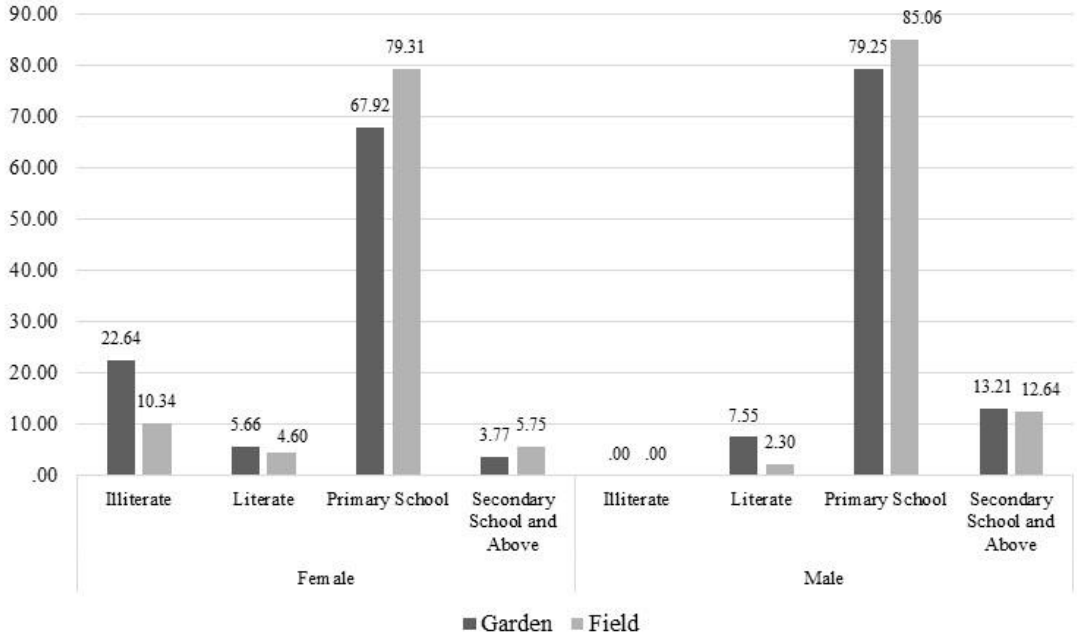

Figure 3. Education level of the dry bean landraces producers by production types (%).

superior to generic products in terms of their suitability for family consumption and taste.

When looking at the preference for DBL's production in the surveyed agricultural enterprises, the features related to the food culture such as the flavor and the cooking time are in the first place and this is another indicator of how effective women are in the selection of local populations (Figure 4). Because of the consumption of dry beans, which have an important place in Turkish food culture, as a meal or as a salad (in the form of a scallop) and being a good source of protein; woman provides not only production as field style but also as garden style. Another element observed during the research is that many green beans were consumed as both green and dry.

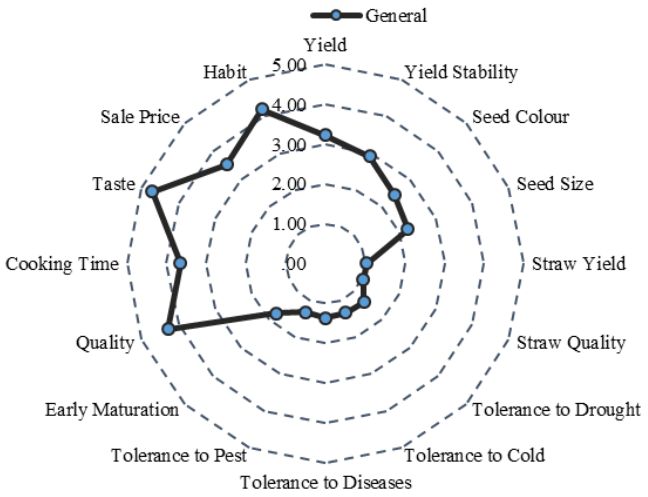

Figure 4. Scale of the production reasons of dry bean landraces.

***Conclusıon*:** Turkey is a country, rather rich in terms of genetic resources. As well as all over the world, the development trends in agriculture in the world, the dietary needs of growing population, and the commercial concerns of the agricultural community leaded the producers also in Turkey to improved varieties with high yield potential. But how much a country maintains biodiversity is in line with how much that country thinks about the future of that country. There are many effective factors in conservation and sustainability of genetic resources. Perhaps the most important of these factors is to raise people's level of consciousness and encourage them. Although men have an active role in production, especially women are invisible heroes in agricultural production. The behavior of women, both consciously and habitually due to their culture, has been influential in reaching many local populations to present day. Women's flavor, taste, food culture and quality perception, and the instinct to feed her family have allowed many landraces to be selected, preserved and produced by women and reached today. For this reason; these results showing that only male-focused studies and agricultural extension activities will be inadequate. The agricultural extension projects should be improved focusing empowerment of women in both agriculture and genetic resource conservation. Women's education is a key important factor in politics to be established about conversation of genetic resources. As a result, a study in which women are ignored or not sufficiently involved in agriculture in rural areas will not adequately serve the conservation and sustainability of genetic resources.

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