LRF-697
[1-5]

RESEARCH ARTICLE Legume Research- An International Journal, Volume Issue : ()

Evaluation of Legume Farming in Turkey and Agricultural Sustainability

A. Kahraman

10.18805/LRF-697

ABSTRACT

Background: Legume production and consumption are essential concepts for sustainability of functional food production, food safety and agricultural sustainability. Production of legumes fluctuates owing to various reasons. The present research aimed to identify current situations and find solutions to sustainability principles. Additionally, the current situation about legume farming in Turkey, the sector situation, future expectations, facilities, strengths and weaknesses, targets, suggestions, plans, as well as the effect on input costs for legumes, profitability, economic and productivity factors, *etc.* production components on key sustainability issues were evaluated.

Methods: In this research during 2021, survey was realized by 200 legume growers in Uşak province with face to face method. In addition to the results obtained, evaluations were made to ensure sustainability by conducting extensive research.

Result: Investigation of this research showed that, legume cultivation is mostly done in small areas, crop rotation is applied with cereals, certified seeds are less preferred due to their expensiveness, pneumatic seeder is used while top fertilizer is not applied. The vast majority of farmers stated that they were not satisfied with legume cultivation. Additionally, there is need for development of better adapted and qualified varieties, standardization of products and easy market opportunity, better cost of input and regulation of product price, well planned schedule for import and political supports.

Key words: Agricultural extension, Farming legumes, Pulse crops, Sustainable agriculture.

INTRODUCTION

Chickpea has an important place in edible legumes and is one of the rare plants that have been cultivated for thousands of years until today. Chickpea is also essential for kid growing owing to amino acids. Chickpea is used for industry as leblebi, starch, paint and flour in addition to medical use (malic acid, malonic acid and citric acid). Healthy and balanced food complementary for cereals due to lycine amino acid, higher digestibility (76-88%) and also has the highest oil ratio (1.6-9.0%) among legumes (Pingoliya *et al*., 2014; Shrivastava *et al*., 2018; Chaudhary *et al*., 2022).

According to official data in 2020-year, chickpea is cultivated on 14.84 million ha by 15.08 million tons production and 102 kg da^{-1} yield over the World (Anonymous, 2021). Table 1 presents chickpea production in the World and ratio of countries based on FAO statistics. Import values of chickpea for Turkey are listed on Table 2. Main supplier is Mexico while total value for import is around 12.707.000$ and 13.236 tons for year. Data for chickpea export of Turkey is shown on Table 3. Total amount is around 76.170.000$ while Pakistan has the most export amount.

Legumes in terms of cultivation area in Turkey, is the most significant place after cereals. According to official data (Anonymous, 2017), legumes were cultivated on an area of approximately 7.9 million decare and 1.2 million tons of production was realized. Total legume cultivation area while 50% of chickpea cultivation area is formed, Uşak is in the third place for sowing. Chickpea cultivation areas decreased by around 7% in 2017 compared to 2013, there was an increase of 10% in 2017 compared to previous year.

Department of Field Crops, Faculty of Agriculture, Selcuk University, Konya-42250, Turkey.

Corresponding Author: A. Kahraman, Department of Field Crops, Faculty of Agriculture, Selcuk University, Konya-42250, Turkey. Email: kahramanali@selcuk.edu.tr

How to cite this article: Kahraman, A. (2022). Evaluation of Legume Farming in Turkey and Agricultural Sustainability. Legume Research. DOI: 10.18805/LRF-697.

Submitted: 11-05-2022 **Accepted:** 20-07-2022 **Online:** 15-08-2022

Chickpea can be grown in marginal lands, can be grown as a winter product, has potential to be used in industry, especially canned, flour and chickpeas, low production cost, environmentally friendly, alternative to crop rotation systems, decrease in fallow areas in some regions, *etc.* it has superior features that enable sustainability principles to reach their goals. Chickpea is the most produced legume in Turkey. Uşak City is one of the most producing cities in Turkey.

Present research was realized to evaluation of the present cases in farming chickpea and legumes to see the potential possibilities of decrease in production. For this purpose, Uşak was chosen due to be an important producer of chickpea and has facilities to increase the production. Furthermore, current statues, effect of costs - inputs and market conditions, sector situation, expectations for future, opportunities, strengths, weaknesses, targets, suggestions, strategies for solution of the problems and policies were evaluated.

MATERIALS AND METHODS

Present research is designed to evaluate the current situation of legume farmers and to make sustainability assessments in order to increase their legume production. For this purpose, 20 survey questions were asked to 200 farmers in Uşak City - Turkey in 2021.

The most produced pulses in Turkey are chickpeas. Uşak province is an important chickpea producer in Turkey. In this study, face-to-face survey method was applied to chickpea growers in Uşak, since it has an important place in cultivation and production of a legume plant necessary for sustainability of agriculture-food. In addition, with this study, it is aimed to reveal approaches to protection of natural resources, to present production systems under environmentally friendly techniques, to reduce fallow areas, to present crop rotation programs and to evaluate winter planting alternatives. Furthermore, present statues, conditions sector, expectations for future, strong and weak sides, facilities, aims, offers, schemes are discussed under sustainability concepts (Kahraman, 2017).

In Selcuk University in 2021, a total of 20 questions about chickpea farming were asked to 200 randomly selected farmers by interviewing according to "Systematic Sampling Method" and, the collected data were transformed to numerical values by computer-based "Microsoft Office-Excel" program which expressed by using percentage (%) unit. Preparation of the questions which were directed in the present research; the main experienced problems in the region were tried to be determined as carefully as possible (Cicek and Erkan, 1996; Senol, 2012).

Table 1: Chickpea production values in the world.

Year	Harvested area (1000 ha)	Production (1000 tons)	Yield (kg da^{-1})
2015	11.819	10.940	93
2016	12.915	11.623	90
2017	14.558	15.151	104
2018	16.177	16.938	104
2019	13.785	14.184	103
2020	14.841	15.083	102
Country	Production (million tons)	Share in production (%)	
India	10.0	72	
Australia	0.8	2	
Canada	0.3	2	
Turkey	0.6	4	
USA	0.6	4	
World	13.8	100	

Table 2: Chickpea import values of Turkey.

Countries	Amount (tons)	Value (1000 $)
Mexico	7.640	8.055
India	2.878	2.555
Ethiopia	1.892	1.399
Italy	522	445
Azerbaijan	200	169
Total	13.236	12.707

Table 3: Chickpea export values of Turkey.

Countries	Amount (tons)	Value (1000 $)
Pakistan	24.959	13.305
Iranian	13.273	10.955
Algeria	8.226	4.017
Syria	7.669	4.628
Saudi Arabia	5.869	3.210
Italy	4.352	2.920
Total	127.404	76.170

RESULTS AND DISCUSSION

In this study, which was realized in 2021, 20 questions (Q) and answers (A) of a total of 200 farmers in Uşak City are given below.

Q1-) How much area (decare = da = 1000m^2 = 0.1 hectare) do you produce chickpeas?
A1-) 0-20 da = 36% 20-60 da = 21% 60-100 da = 22% 100 da and more = 21%
Q2-) How many years have you been dealing with chickpea farming?
A2-) 0-5 year = 16% 5-10 year = 28% 10-20 year = 17% 20 years and more = 39%
Q3-) Do you want to increase chickpea cultivation area?
A3-) Yes = 14% No = 86%
Q4-) What is your reason for choosing chickpea farming?
A4-) Affordable cost = 36% Income from unit area = 22% Soil reclamation = 42%
Q5-) Do you apply crop rotation?
A5-) Yes = 61% No = 39%
Q6-) With which plants do you apply crop rotation?
A6-) Cereals = 64% Forage plant = 36%
Q7-) After which product do you get high yield from chickpeas planted?
A7-) Forage plant = 11% Fallow = 59% Cereals = 30%
Q8-) Are you using certified varieties?
A8-) Yes = 31% No = 69%
Q9-) What are your reasons for not using certified seed?
A9-) It is expensive = 61% I have seeds = 30% Inadequate state support = 9%
Q10-) How do you determine the type of seed you cultivate?
A10-) Disease tolerance =30% According to market demand = 52% According to seed availability = 18%
Q11-) When do you sow the seeds?
A11-) February 15 - February 30 = 23% February 30 - April 15 = 64% April 15 - April 30 = 13%
Q12-) How do you sow the seeds?
A12-) Sprinkle sowing = 3% Pneumatic seeder = 97%
Q13-) Do you make soil analysis?
A13-) Yes = 19% No = 81%

Q14-) How many kg of seeds do you use per decare for planting??
A14-) 10 kg = 18% 10-15 kg = 49%
15-20 kg = 33%
Q15-) When do you apply the fertilizer?
A15-) Before planting = 3% During sowing seeds= 52%
As top fertilizer = 45%
Q16-) How do you ensure weed control?
A16-) Hoeing = 14% Chemical spraying = 86%
Q17-) What are your precautions against anthracnose (Ascochyta blight) disease?
A17-) Using of tolerant seed= 25% Chemical spraying= 52%
Late sowing = 23%
Q18-) How much seed yield do you get per decare area?
A18-) Less than 60 kg = 41% 60 -100 kg = 38%
100 -120 kg = 16% 120 kg and more = 5%
Q19-) When is your harvest date?
A19-) Before 15 July = 11% July 15 - July 30 = 65%
July 30 - August 15=22% August 15- August 30= 2%
Q20-) Do you want to continue chickpea cultivation?
A20-) Yes = 12% No = 88%

According to results of the research, it can be said that chickpea farming is generally made in small areas in Uşak, crop rotation is applied with cereals, farmers use seeds obtained from their own production instead of certified seeds due to be expensive, sowing is done with a pneumatic seeder and no top fertilize is applied. Additionally, the majority of Uşak farmers stated that they were not satisfied with chickpea farming.

Edible legumes, which are frequently preferred by low-income people in many developing countries, have an important place as an important food source in daily consumption of many families. Legume sector in Turkey is important due to be origin of chickpea, lentil, pea and broad bean and a part of fertile crescent, consumption values are much and exporter by means of historically, production potential is higher, possibility for higher quality, feasibility of organic and good agricultural practices and government support, high potential of market, effective system for product certification standards (ISO 17065 17021), having a regulation on contract for production, high margins for marketing, licensed warehousing and existence of product specialized exchanges, progress in land consolidation, completed infrastructure in specialized exchanges, higher qualified legume processing technology, altered law of inheritance and prevention of land division, clustered geographical environment of legume sector, performing of routine inspections for food - ALO 174 Food Line - Call Center of Presidency, network of exporting companies, presence of adequate warehouse of merchant and industrialists, presence of fast food, advanced statuses of advertising and campaigns, growing and developing market structure, increase in purchasing power of consumers and easy access (Sıgırcı, 2015; Kahraman, 2017).

Strengths of legumes, being an important source of protein, nutritional properties and low in fat - high carbohydrates, steady demand, good crop for rotation, chickpeas and lentils reduce drylands and fallow lands, protect and improve soil structure, important for environment, sustainable symbiotic nitrogen fixation mechanism required for agriculture, being an absolute product for rotation programs in sustainable agriculture systems, very high yield potential under optimum growing conditions, short vegetation period and ease of growing second crops, possibility of using chickpeas and lentils in marginal areas, different sowing and harvesting times, main reasons such as better use of workforce in company, getting used to growing pulses and knowing the necessary techniques very well, quality of straw and its importance in animal nutrition, *etc.* are its main features. The mentioned properties increase the value of legumes (Baydar, 2015; Torkaman *et al*., 2018).

Weaknesses of legumes are considered as changing statues from export to import, tax rate of customs, instability of prices, higher costs of input, biodiesel production by using other plants, unsatisfactory seed yield, insufficiency of certified varieties, unsatisfactory supports, incapacity of mechanization or unsuitable varieties, lower gain than other plants, anthracnose problem in chickpea, organization problems and inability of farmers to interfere of price formation, susceptibility of legumes to various environment conditions and diseases, no purchase guarantee, spreading of diseases by sprinkler irrigation, application of traditional techniques, especially virus problem welded by imports, incorrect application (time, dose, frequency *etc.*) of herbicides, insufficient budget for innovation, focus on price for competition, short of production quantity, problem in producing of international quality standards, promotion problems, need for funding, requirement for high capital to licensed warehousing, difficulty in formulating a joint strategy, lack of efforts to increase consumption, changes in taste due to habit of imported products, pollution of information and misinformation, planning for production, chain from producer to consumer (Baydar. 2015; Chaudhary *et al*., 2022). Additionally, costs of production are variable depending on regions.

Suggestions for increasing of legume farming and quality are; supports may be arranged as protein plants, support to using legumes in crop rotation programs, increasing of supports to using certified varieties, development of marketing strategies, increasing of product competition by forming Turkish brand in addition to new marketing approaches, development of suitable production to international standards and shipping to market, increasing support by view of self-sufficiency and development of export and their sustainability, raising awareness among farmers in order to increase chance of competing legumes with alternative products, taking precautions in sector for supporting domestic production and prevention of losing traditional taste, conducting policies to stabilize price of legume markets and activating coordination among stakeholders, identifying and promoting the use of DNA markers in order to determine the origin of domestic

legumes, effective use of international product certification standards (TSE ISO 17065 *etc.*) in sector, production of sufficient legumes and development of licensed warehousing and supporting rental fees of warehousing, establishing a specialized product exchange in order to sector for the purpose of effective marketing system and expand trade with electronic product bills, creation of common strategies for naturally clustered sector in certain regions, increasing and expanding support for research and development and innovation studies in legume sector, preparing public spots which will raise awareness of producers and consumers in marketing of legumes including young people and children as target, transforming legumes into new products that will create added value (especially legume flour based products), making and popularizing traditional legume foods, industrial production which will increase their consumption (lentil patties, hummus *etc.*), increasing the use of legumes in fast food industry by encouraging products in the retail chain (Oguz, 2015; Kahraman, 2017). Furthermore, there is need for support of agricultural policies to enhancement of area of field to sustainability of production.

Strategies; by developing policies to increase pulses production, having an effective marketing system for seeds, expanding trade with electronic product invoices, inoculation with effective Rhizobium bacteria, good agricultural practices, organic farming, *etc.* dissemination of production systems in legumes cultivation, establishment and implementation of integrated product management systems to combat diseases and pests in legumes, encouraging varieties suitable for the region, considering high-yielding varieties as well as quality characteristics in seed selection, strengthening research-extension-farmer relations, regulation of legal regulations and implementation, supporting infrastructure investments, establishing good marketing communication channels of companies (informing about new products, creating demand, frequency of product use, increasing consumer awareness, commitment to creating consumption, creating a company image), policies that will stabilize pulses markets and between stakeholders "Legume Council", which activates the coordination, should work actively by establishing a special product exchange for sector, where all parties of sector come together (Pingoliya *et al*., 2014; Oguz, 2015).

Expectations for future are; decreasing of legume production areas over the world, reduction of legume consumption in developing countries, urbanization presents a reduce in consumption of legumes, global legume consumption is expected to increase by 23% by 2030 due to the increasing world population, the fastest consumption growth is expected in Asian and African countries, despite the decrease in production, imports may increase due to continuing demand for some important legume species (Sıgırcı, 2015; Kahraman, 2017).

Importance of legumes in sustainability of human health should be understood better especially emphasizing their importance on diabetes mellitus Type-2; low glycemic index that is facilitating the cholesterol of blood sugar, increasing insulin secretion, give a feeling of fullness after feeding, obesity; rich pulp content, cardiovascular diseases; risk for diseases is 22% lover on 4 times consumption per week by comparison once a week, regulation of blood lipid profile by decreasing blood cholesterol and lipoprotein level (7% total cholesterol level, 6% LDL cholesterol level, 17% triglyceride level), rich content of magnesium and potassium (decreasing blood pressure), includes folic acid (decreasing blood homocysteine), controlling of blood glucose level and insulin secretion), including isoflavone, saponin and phytosterol (decreasing cholesterol oxidation, decreasing cholesterol absorption of intestinal), prevention of cancer types (colorectal, stomach, lung, prostate, breast types, including resistant starch, higher phytochemicals (isoflavone, tocopherol, glutathione, saponin) and so legumes should be consumed 3 times per week at least (Yan *et al*., 2010; FDA, 2019; USDA, 2019).

Sustainability of healthy food production and safety of food supply are the most important concepts for sustainability principles. Sustainability of agriculture and expansion of industrial use are not rivals as they complement each other. The basic needs of human beings, especially food supply, are undergoing serious changes and meeting the needs is growing day by day. Chickpea is a great source of dietary fiber, healthy diet, diabetes, hemorrhoids, coronary system, types of cancer, *etc.* is of great importance in prevention of diseases. For this reason, it is a type of legume that is an important source of nutrients that should be present in diet. Additionally, chickpea is essential for rotation programs due to having nitrogen fixation mechanism and soil improvement features.

Targets for the improvement of legumes can be listed as expanding cultivation of edible legumes with crop rotation system, establishing industries related to frozen food for green beans, increasing the proportional value of pulses in the production of field crops, as well as chickpea and lentil agriculture in fallow areas.

CONCLUSION

According to results of the present research, there is need to development of suitable varieties for various regions where legume cultivation is possible throughout Turkey, that can adapt to ecological and soil conditions of the region, have high yield and quality, are tolerant to diseases (especially *anthracnose*) and pests, and suitable for machine harvesting. In addition, it is important to work on accelerating the consolidation of agricultural land and increasing the use of certified seeds. The farmers make their decisions about which product to plant; it is understood that it gives according to the product with easy market opportunity and the income it will generate. For this purpose, chickpea cultivation should be made attractive in terms of price. The producers should know that the product he produces will not remain in his possession or market it below its cost. In years when price

decreases in the world markets are experienced or when product supply is high, an intervention agency that will prevent price decreases and purchases on behalf of the state should be established. In recent years, prices have fallen in Turkey against imported products that have entered the market with cheap prices, and the premium amounts given have been insufficient to protect producer income. For this reason, imports should definitely be prevented with non-recipe barriers especially during the harvest period of producer. It should not be late when taking protective measures.

Conflict of interest: None.

REFERENCES

Anonymous, (2017). http://www.tuik.gov.tr (Access date: 17.11.2017).

Anonymous, (2021). http://www.fao.org/faostat/en/#data (Access date: 18.10.2021).

Baydar, S. (2015). Konya Directorate of Provincial Agriculture and Forestry. Legumes Workshop. Konya.

Chaudhary, S., Dhanker, R., Kumar, R. and Goyal, S. (2022). Importance of legumes and role of sulphur oxidizing bacteria for their production: A review. Legume Research. 45: 275-284.

Cicek, A. and Erkan, O. (1996). Tarım Ekonomisinde Araştırma ve örnekleme Yöntemleri. Gaziosmanpaşa Univ, Agriculture Faculty Pub., No:12. Tokat-Turkey.

FDA, (2019). https://www.fda.gov/

Kahraman, A. (2017). Effect of humic acid doses on yield and quality parameters of cowpea [*Vigna unguiculata* (L.) Walp] cultivars. Legume Research. 40(1): 155-159.

Oguz, C. (2015). Selcuk University Agricultural Faculty, Department of Agricultural Economics. Legumes Workshop. Konya.

Pingoliya, K.K., Mathur, A.K., Dotaniya, M.L., Jajoria, D.K. and Narolia, G.P. (2014). Effect of phosphorus and iron levels on growth and yield attributes of chickpea (*Cicer arietinum* L.) under agro-climatic zone IVA of Rajasthan, India. Legume Research. 37: 537-541.

Senol, Ş. (2012). Research and Sampling Methods (Araþtırma ve Örnekleme Yöntemleri - in Turkish). Nobel Akademi Yayıncılık. Ankara.

Sıgırcı, M. (2015). General Directorate of Field Crops and Horticulture Plants Production. Legumes Workshop. Konya.

Shrivastava, L.K., Awanish Kumar, A., Senger, S.S., Mishra, V.N. and Panda, A. (2018). Influence of zypmite on productivity and nutrient uptake of chickpea (*Cicer arietinum* L.) crop under rainfed condition Chhattisgarh plain region. Legume Research. 41(1): 95-101.

Torkaman, M., Mirshekari, B., Farahvash, F., Yarnia, M. and Jafari, A.A. (2018). Effect of sowing date and different intercropping patterns on yield and yield components of rapeseed (*Brassica napus* L.) and chickpea (*Cicer arietinum* L.). Legume Research. 41: 578-83.

USDA, (2019). https://www.usda.gov/

Yan, L., Spitznagel, E.L. and Bosland, M.C. (2010). Soy consumption and colorectal cancer risk in humans. Cancer Epidemiol Biomarkers Prevention Biomarkers. 19(1): 148-158.