International Journal of Agricultural Management and Development (IJAMAD)
Available online on: www.ijamad.com
ISSN: 2159-5852 (Print)
ISSN:2159-5860 (Online)
DOI:10.5455/ijamd.158922

Promoters and Deterrents of Developing Mechanization of Peanut Cultivation in North of Iran

Reza Zehtab Naebi [1], Saeed Firouzi [2] and Mohammad Reza Ebrahimzadeh [3]*

Received: 02 May 2014,
Accepted: 08 July 2014

Abstract

The increasing cost of peanut production is a major concern in Iran. Therefore, developing the mechanization of peanut production is a necessity. In this regard, a three-phase Delphi study was conducted to identify the promoting and deterring factors affecting peanut cultivation mechanization in Guilan Province, the main peanut-producing region in Iran. After preliminary studies, 26 experts were selected as respondents for the study. Based on the final results, 'allocating provincial and national funds to develop mechanization' (with the agreement of 98.07% of respondents), 'Organizing training programs to increase farmers' technical knowledge' (97.12%), and 'conducting the pilot and model projects'(95.19%) were found to be the most important promoting factors in developing peanut cultivation mechanization in north of Iran. Moreover, 'the small size and fragmentation of peanut farms' (with 96.15% of respondents agreeing), 'problems with the national and provincial programs of peanut mechanization' (95.19%), and 'low technical knowledge of farmers and craftsmen about peanut farming mechanization' (94.23%) were identified as the most important deterring factors in developing peanut cultivation mechanization in north of Iran. Given the small area dedicated to peanut cultivation and the low income levels of peanut farmers in north of Iran, it seems that provincial and national funding allocation and peer-planned programming to import appropriate farm machinery are the most urgent plans to improve the status of mechanization of peanut cultivation in north of Iran.

Keywords:
Peanut, Agricultural mechanization, Development, Factors

[1] *Department of Agricultural Management, Rasht Branch, Islamic Azad University, Rasht, Iran.*
[2] *Department of Agronomy, Rasht Branch, Islamic Azad University, Rasht, Iran.*
[3] *College of Agriculture, Yadegar - e- Imam Khomeini (rah), Shahr-e-rey Branch, Islamic Azad University, Tehran, Iran.*
* *Corresponding author's email: firoozi@iaurasht.ac.ir*

INTRODUCTION

The peanut (*Arachis hypogaea* L.) is the world's fourth most important oilseed and third largest source of vegetable protein. Its seed consists of high quantities of edible oil (43–55%) and protein (25–28%) content (Ravi Kumar, 2012; Maiti and Ebeling, 2002). Due to high nutritive value of peanut's grain, it can play an important role in improving the nutrition of low-income countries, provided that increased production leads to lower prices (Khajepour, 2004). Furthermore, the peanut leaves and stems can be used to feed livestock, and the pod skins are an important source of biomass energy and raw materials used to make particle boards.

In Iran, total peanut cultivated area is estimated at 3000 ha, more than 80% of which (2500 ha) is located in Guilan Province, in the north of the country. Annual pod and grain productions are estimated at 9000 and 6750 tons, respectively. Most of the product is consumed directly, and total annual production does not meet the domestic demand; consequently, peanuts are imported from some peanut producing countries such as Iraq and China.

Except for the tillage operation, the levels of mechanization of the other practices of peanut cultivation are close to zero in Iran. Traditional cultivation increases costs, thus decreasing farming profits. As a result, the level of income is low, and farmers are forced to change their peanut farms into orchards or use the land for other high-income activities. In order to improve farming income, the development of mechanization is essential. With implementation of mechanization, the cost of cultivation may be reduced to a considerable level (Roy and Bezbaruah, 2002).

To develop a successful mechanization plan, promoting and deterring factors and existing potentials must be studied. In this regard, a research performed in the Slovak Republic that was aimed at achieving the strategy of mechanization identified "grants and funding to provide agricultural implements and machinery" as well as "technical assistance", and "the promotion of training in the use of farm machinery" as the most important factors (Clarke *et al.,* 1993). The study of Ghosh (2010) in Burdwan districts of India showed that such factors including irrigation, access to institutional credits, and size of farms had a positive significant effect on the level of farm mechanization. Their study also revealed that youth were more eager to choose mechanized farming than the old farmers. Old traditions were found to be as a deterrent to the development of agricultural mechanization too. Olaoye (2007) noted that timeliness of agronomical operations, socio-economic issues; agro-ecological problems, technical skills and services are the key factors of favored farm mechanization. In the study of Olaoye and Rotimi (2010) conducted to determine the mechanization index and analyze agricultural productivity in southwest Nigeria, a sustainability analysis of the plans showed that inconsistencies in agricultural mechanization policy, lack of desirable conditions for full integration of farm mechanization, lack of fundamental infrastructure, and funding, among other variables, explained the observed low spectrum in the scale of production. Ou *et al.* (2002) stated that agricultural mechanization as system engineering depends not only on the development of farm machinery, but also to the cooperation and coordination of many other factors. In recognition of this fact, environmental, agricultural, social and economic, the mechanization of agriculture and the sustainable use of their technology investments should be considered. Rasouli *et al*. (2010) investigated the factors affecting the development of mechanization of sunflower farms in Iran using the Delphi technique. Based on their results, 'the small size of sunflower fields' and 'the fragmentation of holdings' were found to be the most important deterring factors to the development of mechanized sunflower cultivation in Iran. A review of the status of agricultural mechanization in north of Ahwaz county of Khuzestan, Iran indicated that 'the low skill of operators' and 'poor management of farm machinery use' caused the mechanization of agriculture in the region to be undesirable (Loveimi and Almasi, 2003). Najafi (1990) identified 'small farms', 'low levels of literacy', 'high prices and shortages of agricultural ma-

chinery', 'the high cost of agricultural inputs', and 'the lack of investment in agriculture' as the major obstacles preventing the development of agricultural mechanization. Asoegwu and Asoegwu (2007) studied the problems of agricultural mechanization in Nigeria. They recommended the use of IT in agricultural management to achieve sustainable agriculture in Nigeria.

A review of reports showed that no research has yet been performed on identifying promoting and deterring factors of the development of mechanized peanut farming in Iran. Because of the unfavorable status of mechanization of peanut production in Iran, identifying the effective factors is essential. So, the aim of this research was to study the promoters and deterrents of mechanized peanut farming in Guilan Province, the main peanut producing region in Iran.

MATERIALS AND METHODS

This research was conducted in Guilan Province in north of Iran. This province is the center of peanut production in the country. A three-phase Delphi technique was used for the study. The Delphi method is a group communication process that aims to achieve consensus on a special topic on real world (Hsu and Sandford, 2007). This method is based on the fact that expert and elite opinions in every scientific area are the most authoritative. Unlike other survey methods, the reliability of the Delphi technique is not based on the number of participants in the research, but on the scientific credibility of participating experts. Therefore, based on the advice of the university professors, 26 agricultural experts who work in the agricultural administrations of Astaneh Ashrafieh and Kiashahr as well as the Jihad-e Agriculture Organization of Guilan Province were qualified to participate in this research. Before distributing the questionnaires, respondents were informed of the research technique and goals. In the first phase of the study, two open questions were raised in the form of a descriptive questionnaire, and respondents were asked to answer the questions below:

A) What are the promoting factors of developing the mechanization of peanut farming in Guilan Province?

B) What are the deterring factors of developing the mechanization of peanut farming in Guilan Province?

The questionnaires were delivered to the respondents and collected personally. Then, the results were summarized and arranged as single items. 17 items were identified as promoters

Table 1: Delphi study round one: promoters in developing the mechanization of peanut cultivation in north of Iran.

Items	Freq.	%
Organizing training programs to increase farmers' technical knowledge	26	100.0
Planning to integrate peanut farms	21	80.77
Allocating provincial and national funds to develop mechanized farming	20	76.92
Peanut farmers' reception of new methods of peanut farming	19	73.08
Macro-planning in the production of special machinery for peanut farming	18	69.23
Providing special credits to buy peanut farm machinery	17	65.38
Economic advantage of mechanized farming over traditional method	17	65.38
Encouraging the youth to enter peanut farming	14	53.85
Aggregation of peanut fields through the formation of cooperatives	13	50.00
Organizing field trips to mechanized farms throughout the country	12	46.15
Increasing technical knowledge by distributing brochures and flyers	12	46.15
Implementing pilot and model projects	11	42.31
Identifying pioneer farmers and encouraging the use of peanut machinery	10	38.46
Supportive plans to design appropriate peanut cultivation machinery	8	30.77
Organizing professional companies for mechanization of peanut cultivation	8	30.77
Educating mechanization experts about new technologies	7	26.92
Directing research toward peanut cultivation mechanization	4	15.38

Table 2: Delphi study round two: promoters in developing the mechanization of peanut cultivation in north of Iran

Items	Normal weight	Priority
Allocating provincial and national funds to develop mechanization	7.148	1
Identifying pioneer farmers and encouraging the use of peanut machinery	6.925	2
Organizing training programs to increase farmers' technical knowledge	6.850	3
Implementing pilot and model projects	6.850	3
Supportive plans to design appropriate peanut cultivation machinery	6.776	4
Planning to integrate peanut farms	6.701	5
Providing special credits to buy peanut farm machinery	6.627	6
Economic advantage of mechanized farming over traditional method	6.553	7
Peanut farmers' reception of new methods of peanut farming	6.404	8
Directing research toward peanut cultivation mechanization	6.329	9
Encouraging the youth to enter peanut farming	6.106	10
Educating mechanization experts about new technologies	5.882	11
Organizing field trips to mechanized farms throughout the country	5.659	12
Macro-planning in the production of special machinery for peanut farming	5.287	13
Organizing professional companies for peanut mechanization	5.212	14
Aggregation of peanut fields through the formation of cooperatives	4.691	15
Increasing technical knowledge by distributing brochures and flyers	4.468	16

and 17 as deterrents. In the second phase of the Delphi technique, all items were written in the form of a five-point Likert scale (ranked in five levels of "very little", "little", "to some extent", "much", and "very much"), and the secondary questionnaires were distributed among the respondents. Scores were assigned as 1=very little, 2=little, 3=to some extent, 4=much, and 5=very much, and the results were analyzed using SPSS software. The final results were arranged and designed in the form of special tables. Kendall's W test confirmed the necessity of applying the third phase of the Delphi technique. In the third phase of the research, the top 10 items were selected from the results of the second table. Using the last selected items, a multiple-choice questionnaire was designed and the respondents' levels of agreement to each item were requested. After the questionnaires of the third phase were gathered, the results were averaged, rated, and arranged. The results of Kendall's W test showed that there was no need to go to the next stage.

RESULTS AND DISCUSSION

Promoter factors

The results of the first phase of the Delphi technique, based on the frequency of responses to the first open question (What are the promoters of developing the mechanization of peanut farming in Guilan Province?) led to the creation of a 17-item list of promoters (Table 1). The results indicated that 'organizing training programs to increase farmers' technical knowledge', 'planning to integrate peanut farms', and 'allocating provincial and national funds to develop mechanized peanut farming' were the factors mentioned most by the respondents (26, 21, and 20

The items listed in Table 1 were used to carry out the second phase of research. Table 2 shows the respondents' levels of agreement with each of the items in the second phase. According to the findings of this table, 'allocating the provincial and national funds' was the top promoter with a normalized weight of 7.148. This factor was also one of the three important factors mentioned most by respondents. 'Identifying pioneer farmers and encouraging the use of peanut farming machinery', which was mentioned by 38.46% of the experts in the first phase, was recognized as the second most important promoter with a normalized weight of 6.925. 'Organizing training programs to increase farmers' technical knowledge' was mentioned by 100% of respondents in the first phase and received a normalized weight of 6.850. It was ranked third among the promoting factors.

According to the third phase findings (Table 3), 'allocating the provincial and national funds

Table 3: Delphi study round three: promoters in developing the mechanization of peanut cultivation in north of Iran

Items	Assent (%)	Priority
Allocating the provincial and national funds to develop mechanization	98.08	1
Organizing training programs to increase farmers' technical knowledge	97.12	2
Conducting the pilot and model projects	95.19	3
Supportive plans to design appropriate peanut cultivation machinery	92.31	4
Identifying pioneer farmers and encouraging the use of peanut machinery	91.35	5
Providing special credits to buy peanut farm machinery	90.38	6
Planning to integrate peanut farms	89.42	7
Economic advantage of mechanized farming over traditional method	88.46	8
Directing research toward peanut cultivation mechanization	86.54	9
Peanut farmers' reception of new methods of peanut farming	79.81	10

to develop mechanization', agreed upon by 98.08% of respondents, was identified as the first promoter priority, and 'organizing training programs to increase farmers' technical knowledge', agreed upon by 97.12% of respondents, was identified as the second promoter priority. In Clarke *et al*., study (1993), 'financial and technical support' was also recognized as being among the most important factors in the development of agricultural mechanization in the Slovak Republic and Loveimi and Almasi (2003) suggested that the training and extension programs should be used to improve the status of farm mechanization in north of Ahwaz county, Iran. 'Access to institutional credits' also was identified to be a promoter in developing farm mechanization in Burdwan districts of India (Ghosh, 2010). In the current study, 'conducting the pilot and model projects', 'supportive plans to design appropriate peanut cultivation machinery in the Guilan Province', 'identifying pioneer farmers and applying incentive policies to utilize peanut farming machinery', and 'providing special credits to buy peanut farm machinery' were agreed upon by 95.19%, 92.31%, 91.35%, and 90.38% of respondents, respectively. According to a final decision, all six factors stated above, which were agreed upon by over 90% of respondents, were considered as the most important promoters of developing mechanized peanut farming in Guilan Province.

Table 4: Delphi study round one: deterrents in developing the mechanization of peanut cultivation in north of Iran

Items	f	%
High price of peanut cultivation machinery	26	100.0
The small size and fragmentation of peanut farms	26	100.0
Specialized peanut farming machinery	21	84.62
Low level of technical knowledge of farmers and craftsmen about mechanization	20	76.92
The small size of the overall peanut cultivated area	19	73.08
Uncertainty of the proper performance of peanut machinery	18	69.23
Lack of a national and extra-provincial view towards peanut farming	18	69.23
The high frequency of rented peanut farms	16	61.54
Unavailability of special peanut cultivation machinery in the region	16	61.54
The irregular geometric form and unevenness of peanut farms	12	46.15
Lack of peanut processing and packing implements	12	46.15
Problems with the national and provincial programs for peanut mechanization	12	46.15
Low level of economic motivation for planting peanut	11	42.31
Intercrop cultivation of beans and peanuts	11	42.31
Delayed peanut planting	10	38.46
Lower importance of peanut cultivation compared to rice in the region	8	30.77
Seasonal rainfall which hinders the movement of machinery during planting	8	30.77

Table 5: Delphi study round two: deterrents in developing the mechanization of peanut cultivation in north of Iran

Items	Normal weight	Priority
Lack of a national and extra-provincial view towards peanut farming	7.153	1
The small size and fragmentation of peanut farms	7.080	2
Problems with the national and provincial programs for peanut mechanization	6.715	3
Unavailability of special peanut cultivation machinery in the region	6.642	4
Specialized peanut farming machinery	6.569	5
Low technical knowledge of farmers and craftsmen about farm mechanization	6.350	6
The irregular geometric form and unevenness of peanut farms	6.277	7
Lack of peanut processing and packing implements	6.204	8
High price of peanut cultivation machinery	5.912	9
Uncertainty of the proper performance of peanut machinery	5.766	10
Low level of economic motivation for planting peanut	5.475	11
The small size of the overall peanut cultivated area	5.402	12
Seasonal rainfall which hinders the movement of machinery during planting	5.256	13
Delayed peanut cultivation	5.037	14
Lower importance of peanut cultivation compared to rice crop in the region	4.964	15
The high frequency of rented peanut farms	4.818	16
Intercrop cultivation of beans and peanuts	4.380	17

Deterrent Factors

The results of the first phase of the Delphi method, based on the frequency of responses to the open question (What are the deterrents of developing the mechanization of peanut farming in Guilan Province?) led to the creation of a 17-item list (Table 4). As seen, 'High price of peanut cultivation machinery which is not justified in small farms', 'the small size and fragmentation of peanut farms', and 'specialized peanut farming machinery' were mentioned the most by the respondents (26, 26, and 21 times, respectively).

Table 5 presents the second phase results regarding identifying deterrents of developing peanut farming mechanization. According to this table, 'lack of a national and extra-provincial view towards peanut farming' was the top deterrent with a normalized weight of 7.153. Moreover, 'the small size and fragmentation of peanut farms' and 'problems with the national and provincial programs for developing peanut production mechanization' were considered the second and third most important deterrents with normalized weights of 7.080 and 6.715, respectively. The first 10 items selected from the table of the second phase of research were re-evaluated in the next phase.

Table 6 indicates that 'the small size and fragmentation of peanut farms' was agreed upon by 96.15% of respondents and was considered to be the most important deterrent. This result is

Table 6: Delphi study round three: deterrents in developing the mechanization of peanut cultivation in north of Iran

Items	Assent (%)	Priority
The small size and fragmentation of peanut farms	96.15	1
Problems with the national and provincial programs of peanut mechanization	95.19	2
Low level of knowledge of farmers and craftsmen about farm mechanization	94.23	3
Unavailability of special peanut cultivation machinery in the region	92.31	4
Specialized peanut farming machinery	91.35	5
Lack of a national and extra-provincial view towards peanut farming	90.38	6
The irregular geometric form and unevenness of peanut farms	88.46	7
Low level of economic motivation for planting peanut	85.58	8
Lack of peanut processing and packing implements	84.62	9
The small size of the overall peanut cultivated area	83.65	10

in line with what Rasouli *et al*. (2010) asserted in their study of effective factors in the mechanization of sunflower farms in Iran and with Balachandran's (2003) study that investigated the effective factors in the mechanization of rice in Kerala. Moreover, 'the problems with the national and provincial programs to develop peanut mechanization in Guilan Province, which was agreed upon by 95.19% of the experts, ranked second. In the work of Rasouli *et al.* (2010), 'lack of a national mechanization strategy for the development of mechanization of peanut cultivation' was regarded as the third most important factor. 'Low level technical knowledge of farmers and craftsmen about mechanized farming activities' was agreed upon by 94.23% of the experts and was ranked third among deterrents. 'Unavailability of special peanut cultivation machinery in the region', 'specialized peanut farming machinery', and 'lack of a national and extra-provincial view toward peanut farming mechanization' were agreed upon by 92.31%, 91.35%, and 90.38% of respondents, respectively, and followed in rank. Finally, the six mentioned items, which were agreed upon by over 90% of respondents, were considered the most important deterrent factors of developing mechanization of peanut cultivation in north of Iran.

CONCLUSION

The Delphi technique study showed that the main promoters of peanut farming mechanization in north of Iran were 'allocating provincial and national funds to develop mechanization', 'Organizing training programs to increase farmers' technical knowledge' and 'conducting the pilot and model projects'. Besides, 'the small size and fragmentation of peanut farms', 'problems with the national and provincial programs of peanut mechanization', and 'low technical knowledge of farmers and craftsmen about peanut farming mechanization' were recognized as the most important deterrents of developing peanut mechanized production in north of Iran.

ACKNOWLEDGEMENTS

The authors are grateful for the funding supplied by the Rasht branch, Islamic Azad University.

REFERENCES

1-Asoegwu, S.N., & Asoegwu, A.O. (2007). An Overview of Agricultural Mechanization and Its Environmental Management in Nigeria. *Agricultural Engineering International: the CIGR E-Journal*. Invited Overview 6(9), pp, 22., Retrieved September 18, 2014, from http://ecommons.cornell.edu/bitstream/1813/10680/1/Invited%20overview%20Asoegwu%20final%203May2007.pdf

2- Balachandran, P.G. (2003). Constraints on Diffusion and Adoption of Agro-mechanical Technology in Rice Cultivation in Kerala, Retrieved from http://kkr-pcds.org/publication/ downloads/59.pdf.

3- Clarke, L.J., Morrison, T.A., Juricek, J., & Studenik, B. (1993). The Slovak Republic: Agricultural mechanization strategy, a review. Retrieved January 21, 2007, from http:// www. fao.org/ agris/ Centre.asp? Content.

4- Ghosh, B.K. (2010). Determinants of farm mechanization in modern agriculture: A case study of Burdwan districts of west Bengal. *International Journal of Agricultural Research*, 5(12), 1107-1115.

5- Hsu, C., & Sandford, B.A. (2007). The Delphi Technique: Making Sense of Consensus Practical assessment. *Research & Evaluation*, 12(10), 1-8.

6- Khajehpour, M.R. (2004). *Industrial plant*. Isfahan University of Technology. Publications Unit, Jihad e daneshgahi of Isfahan. (In Persian).

7- Loveimi, N., & Almasi, M. (2003). Investigation of the status of mechanization in north of Ahwaz county. *Iran Journal of Science and Technology of Agriculture and Natural Resources, Water and Soil Sciences,* 7(2), 227-239. (In Farsi).

8- Maiti, R., & Ebeling, P.W. (2002). *The peanut* (*Arachis hypogaea* L.) crop. USA: Science Publisher, pp. 376.

9- Najafi, B. (1990). Investigation of present status and farmers views to the agricultural mechanization. *University of Ahwaz, Iran Scientific Journal of Agriculture*, 14(1, 2), 18-31. (In Persian).

10- Olaoye, J.O. (2007). An Evaluation of Farm Power and Equipment Ownership and Management in Niger State, Nigeria. *Nigerian Journal of Technological Development,* 5 (1 , 2), 94 – 102.

11- Olaoye, J.O., & Rotimi, A.O. (2010). Measurement of Agricultural Mechanization Index and Analysis of Agricultural Productivity of some Farm Settlements in South West, Nigeria. *Agricultural Engineering International: the CIGR E-journal*. 12(1), 125-134. Retrieved from http://www.cigrjournal.org

12- Ou, Y., Yang, D., Yu, P., Wang, Y., Li, B., & Zhang, Y. (2002). Experience and Analysis on Sug-

arcane Mechanization at a state farm in China. 2002 ASAE Annual International Meeting/ CIGR 15th World Congress Sponsored by ASAE CIGR, Hyatt Regency Chicago, Illinois, USA July 28- 31.
13- Rasouli, F., Sadighi, H., & Minaei, S. (2010). Factors Affecting Agricultural Mechanization: A Case Study on Sunflower Seed Farms in Iran. *Journal of Agricultural Science Technology*, 11, 39-48.
14- Ravi Kumar, H.S., Janakiraman, N., Sheshadri, T., Venkate Gowda, J., & Vijaymahantesh (2012). Integrated Organic Nutrient Supply Systems on Growth and Yield of Groundnut (*Arachis hypogaea* L.). *Environment & Ecology*, 30 (1), 118-121.
15- Roy, N., & Bazbaruah, M.P. (2002). *Agricultural growth and regional economic development (A Study of Barak valley).* Mittal Publication, New Delhi.