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The effect of mechanization level on canola production in south of Iran

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ABSTRACT: In this study the effect of mechanization level on canola production was investigated by dividing the producers based on mechanization level and using of mechanization index in production function. The result showed that in low mechanization group following 10% increase in water, poison and chemical fertilizer (labor) application, the output will increase (decrease) about 4.3,2.2 and 6.2 (8.7) percent respectively .In the high mechanized group (farmers), specified that water, labor and machinery inputs have a negative effect on production and positive impact on seed. Evaluation the effect of mechanization based on value of total inputs in industry showed that following 10% increase in mechanization the yield will increase about 1.3 percent. Also the results of another pattern that using machinery cost to total machinery and labor cost ratio, showed that 10% increment in the mentioned index, the canola production per area will increase about 6.9 percent.

Key Words: Canola, mechanization, production, Fars province,

INTRODUCTION

Edible oil is one of foodstuffs that supply through import, and yearly part of foreign exchange allocated to this goods. For Example in 2001 more than 1925 bilion Rials allocated to import of import of this commodity (plan and management organization, 2000). Interior resource developing for edible oil production can be a suitable way to economize foreign exchange that allocated to this commodity. Among oily grains canola is at third place with 14.7 percent of total vegetable oil that produce in the world, attar Soya and oily palm. Large amount of oil in canola grain that in some cultivars reach to 48 percent and also suitable composition of fatty aids of breaded cultivar caused the canola dominant on the word oil bazaar, (Dehshiri, 2001). Extending of canola cultivation in Iran is possible and could be effective to decrease the affiliation to foreign along with development of olive cultivation. Producing of this crop has been reached from 50-65 ton since 1372 to 17090 ton at 2002 (Agriculture research and education organization, 2002). Because of importance of mentioned items, it seems that increase in canola production is necessary and capable.

Generally, the producing increase through two way :

(i) Increase in cultivation area.

(ii) Yield increase per area.

Because of scarcity of important factors such as water, must be tried to increase yield through applying proper inputs and usage of new techniques .Awareness from optimal economy use of inputs is important for programming.

Because extreme use of them in addition to low production cause cost increase and to be wasted national investment too. Totally Mazandaran and Golestan province are 80 percent of canola production of Iran .Fars province also is in fifth place with 340 ton production and about 2% of country production. Presence of diversity of climate in Fars province and also adaptation of various cultivars of canola to ecological diversity, has made this province to potential area for canola cultivation (Agriculture ministry, 2002). So this study can to take as a trying to investigate In this study has been tried that evaluated producing condition among canola producers in fars province view point of mechanization level and investigate its effect on producing by use of related indices. Considering that used approaches for economy analysis's and demonstrating syllogistic analysis's between two group of producers with different mechanization level that are based on producing.

Function approach in this chapter have been presented some of studies that is done into and out of country which performed for economy analysis by using of sorgam difference exploitation in India rising from mechanization growth.

Study of Deng *et.al.*, (2005) showed that 45% of production growth of agriculture in china rising from growth nd technological inputs (chemical fertilizer ,machinery and irrigation).

Singh (2006) showed that during 1971-96 about 74% of agriculture crop yield increase in India rising from mechanization growth Haji Rahmi (1996) compared two groups of dry farmers (Row planter and hand seeded) in Bukan area by syllogistic analysis.

The results of this study showed that use of Row planter in total, resulted to more logical use of produced factors. Kuroda (1987) introduced that change in agriculture, labor operation in India resulting from changes in producing factor cost and tending to technology change.

Randhir and Krishna Noorthys (1990) were investigated, farmer operation among two group of Indian producers who are in different level with the view point of irrigation equipments usage have an important rolein exploitation increase. Lilyan *et.al,* findings among developing countries showed that the main increase in crop has been accomplished through increase in machinery and chemical inputs. Tiongco and Dawa (2002) believed that use of rice intensive technology among philippine rice growers relatively caused operation increase of producing factors. Gerdin (2002) estimated that total operation growth of producing factors in kenia during 1964-1996 is equal to 0.36%. According to Kazemnejhad and Kupahi study (1996) total operation of labor inputs obtained wqual to 3088.

Also total operation of used seed, number of irrigation and consumed poison for garlic producing in Hamedan obtained 0.0009, 0.2 and 0.17 respectively.

Seyedan (2001), Salami (2001) by use of profiting index of total producing factors estimated the normal size of Resture width for each family in Fars province equal to303 hactar.

Seyedan findings (2002) showed that more that than 50% of sugar beet growers of Hamedan have negative operation.

MATERIALS AND METHODS

Production function of kab-Doglass expresses the relation between crop and specific input sand shows the effect of producing factor such as labor, irrigation and technology on crop (Fan, 1991; Lin,1992; Ahmad and Bravo-urata, 1995; Kaufman and Snell, 1997; Carter and Zhang, 2001; Deng *et al*, 2005). This model compared to another models has characteristics that has been resulted it is more proportionate with economy theory. Desired characteristics are flexibility in turning into data and low sensivity toward total error occurred in observations (sharama *et al.,* 1997). The results of Ferdosi and Yazdani research (1374) in cotton producing investigation had indicated a superiority of kb- Doglass model to Transcendental model view point of mentioned subjects, in this study used fromkab-Doglass function too. Total form of mentioned function is as following:

$$I = l,\ldots\ldots\ldots\ldots,n$$

$$Y=A\prod_{i=1}^{n} xi^{Bi}$$

That in with x is inputs or predating factor vector, B_i is estimated parameters ad shoes the share of selected producing factors in Y crop producing and parameter A shows Torsh model, and include error sentences resulting from canceling some factors rising from difference between zone in model (Deng *et.al.,* 2005). This function becam linear due to logarithm and it is computable it h O.l.S method (minimum normal squares). One of main characteristics of this function is congenial $\sum n^{B1}$ degree and also each of coefficients show partial tension producing of each input. While show total yield coefficient to measure.

In this research athirst by use of k-mean clustering analysis method, producers divided to two level of mechanization and for each of them estimated kab-Doglass producing function separately .

k-mean method for classifying the observation, first each item related to cluster that have the nearest distance (mean) to central observation. Then Euclids distance of each observation from center of bunch is calculated and allocated to the nearest bunch again. Euclids distance between two observation is as following too, (Johnson and Vichern, 2000):

$$D(x,y)\sqrt{(x-y)' A (x-y)}$$

Where in A = S-1 and S is variances and covariance's matrix of sample. Comparison with competitor method to cluster, this method is preferred,(Johnson and Vichern, 2000). Benefit of this method is that without need to information of number of dividable cluster cn classify the observations, (SPSS Inc, 2002). By use of this method and follow by apply from Deng *et.al.,* findings (2005) the producers divided into two groups based on level use of items such as chemical fertilizer, irrigation equipments and machinery. Then only observation that based on each three measured belonged to one level of mechanization (high and low mechanization level) were placed in one group and the observation that were placed in different group based on mentioned inputs were not used. Furthermore above approached, two mechanization indices defined as on independence variable and used from them into keb-Doglass function. These indices defend so: first index was obtained from Karter *et al.,* study (1999) and mid study, (2000). They believe that amount of input use which have made in industry part are indicating of producers mechanization level. For this reason, the inputs which were made in industry part such as chemical fertilizer, kinda of poison, machinery and irregation equipments used as index that express mechanization in kab-doglass producing function.

Also Singel (2006) has introduced following ratio as index that express mechanization :

$$I = \frac{C_m}{C_H+C_A+C_M}$$

That in which I is indicating mechanization level, C_M, C_H and C_A are machinery use cost, labor and beast force respectively. In view point of introduced indices the form of producing function is $Y = Ax_1^{a1} \ldots x_n^{an} I^B$ that in which X is inputs vector or producing factor, a_i and B are estimating parsmeter and they indicate portion of selected producing factor in Y crop producing. It is mechanization index and parameter A including Torsh model.

Profiting (putting into operation). Generally, two kind of maximum and moderate profiting was used. Maximum profiting is amount of taken that last unit of given ratio, (Salami, 2001). Maximum profiting specify simply by estimating of producing function. In the case of kab - Doglass function MP states. So, $mp = e_1 Y.X$. That in which Y is crop and x_i is inputs and e_i is tension of each inputs. In this research, data was obtained through completing the questionnaire among canola producer in Eqlid and jahrom city .Statistic sample was selected by using of random method and included 63 producers. Also for data analysis was applied from Views 4 and SPSS 11 software

RESULTS AND DISCUSSION

In this study for investigating the effect of mechanization on producing among elected producers in Fars province (Eqlid and Jahrom zon) was used from conducted three method that used from complex index of Deng et.al study (2005) and based on that producers divided to groups with different mechanization level. In continuation in this method estimated amount of id of each factors between two groups and analyzed. Based on way that mentioned in research methodology for classifying the observations, 24 observations placed in high mechanization level and 28 observation reposed in low mechanization level and 11 observation were not used because of difference replacement in different groups according to applying introduced inputs level. In second method it used from karter *et al*., (1999) and mid (2000) definition to investigate the effect of mechanization. In third method, it used from singh index (2006).

A). Analysis the effect of mechanization based on cluster analysis in clustering and comparison two groups viewpoint of inputs level usage, first result of correlation coefficients estimation, (Table 1) and then result of kub-Doglass producing function estimation (Table 2) has been presented for each group.

A) Producers with low mechanization:

A s you seen at table (1) Relation between yield is negative just with labor variable. But labor variable coefficient both view point of statistics and absolute rate have low importance .The relation between yield and another variables is positive that this relation except seed input in case of another variables have significant importance. According to above coefficient chemical fertilizer have most correlation with crop yield (67.4%) correlation coefficient between yield and machinery inputs, water and poison are 55.5, 49.8 and 46.8 percent respectively. Also correlation coefficient with three mentioned variable is relatively high too. The results of kub-Doglass production function estimation for producers with low mechanization level has been shown in Table 2.

Table1: Pierson correlation coefficient between variables.

Variable	Mechanization level	Yield	Machinery	Chemical	Chemical fertilizer	Seed	water	Labor
Yield	High	1						
	Low	1						
Machinery	High	-0.113	1					
	Low	0.555**	1					
Chemical fertilizer	High	-0.116	-0.109	1				
	Low	0.674**	0.620**	1				
Poison	High	0.019	0.598**	-0.075	1			
	Low	0.468*	0.684***	0.680**	1			
Seed	High	0.428*	-.121	-0.261	0.023	1		
	Low	0.325	0.229	0.685***	0.352	1		
Water	High	-0.088	0.477*	0.156	-0.239	-0.153	1	
	Low	0.498*	0.365	0.440*	0.501*	0.366	1	
labor	High	0.045	0.175	0.080	-0.160	0.188	0.429*	1
	Low	-0.145	-0.051	0.233	0.219	0.345	0.281	1

*,**,***,significant at1,5 and10 percent respectively

Table 2 : Result of profiteers production function estimation.

Variable	Coefficient		Standard error	
	Low mechanization	High mechanization	Low mechanization	High mechanization
Y	25.35	-10.112	9.162	14.820
Poison	0.218**	0.078	0.158	0.171
Chemical fertilizer	0.619**	0.066	0.310	0.305
Seed	-	1.601**	-	1.04
Water	0.430**	-0.188*	0.211	0.134
Labor	-0.867**	-0.389***	0.291	0.226
Machiner	-0.599	-0.992**	0.656	0.488
Place illussive variable	-1.304***	0.608	0.447	0.534
F=10.789***			R^2=0.521	

*,**,***, significant at1,5 and10 percent respectively

The correlation between machinery input just have significant importance with two chemical fertilizer variables correlation between chemical fertilizer with poison seed and water inputs is positive and significant. Looking to results of table (1) and (2) shows that in the case of poison, water and chemical fertilizer inputs there are a relative conformity between results of two methods. In the case of mentioned variable the coefficient are closed to each other ,and they have same sign and they are significant. About machinery input there are basic contradiction between result of two table, in the case of this input furthermore significant difference, their sign is adverse too. As you saw in correlation coefficient table, the correlation between poison and seed coefficient with another inputs is high. Necessarily first poison variable canceled from pattern and then one pattern estimated without presence of seed variable. The results of Torsh test method of Reset Ramsy showed that by deleting poison variable the pattern will engage Torsh expression raising from essential variable omission and so the seed variable deleted from pattern. As you see in this table the coefficient of labor variable is negative .It means that increment of this usage cause decrease production level. Findings of Seydan (2002) showed that about 85% of sugar beet producers in Hamedan. More use of labor input cause production decrease. Also about poison and chemical fertilizer variables expected that by increase use of this inputs increase the production .According to 10% increment in use of water, poison and chemical fertilizer (labor) inputs crop production rate will increase (decrease) about 4.3, 2.2 and 6.2 (8.7) percent respectively. Another variable that have significant effect on producing lever of producers is place illusive variable. In this pattern place difference in two elected Zone (Eqlid and Jahrom) took into consideration by use of one illusive variable containing two level, the level 1 for Eqild producers and level 2 for jahrom producers.

According to this variable coefficient, the production condition is more desirable than its condition in jahrom zone. Then it observed that the producers don't operate coefficients in view point of production function figure, indicate efficiency to measure ratio.

Total significant coefficient of model is positive (+0.4). So efficiency to measure ratio of producers is descending. There for by 100% increment in all inputs, producing rate per area will increase 40%. According to F factor, total variable that was used in model have significant importance. These variables able to explain more than 71% of variation in production per area (yield) of producers. The results of parent test express nonexistence of variance heterogeneous.

Also findings of Resot Ramsy test indicated the lack presence of Torsh expression. According to difference in the results of two analyses of correlation and regression, it is necessary that take caution with results. Total profiting of significant variable including chemical fertilizer, water, labor and poison obtained equal with 4.82,73,-356 and -1.8 respectively. Therefore one unit (kg) increment in applying of chemical fertilizer will have 4.82 kg increase in crop. Also increase in water use amount 1000 m^3, will cause 73 unit increment in crop .increase in labor use amount one day-person in one hectare will cause 356 kg decrease in crop. In case of poison, more use of it equal with 1000 Rials will result 4.3 kilograms increase in crop.

B) Producers with high mechanization level:

In this group also first investigated relation between variables by looking at this table results, it specify that relation between yield with inputs, excepted about seed input , have no significant importance. Correction between machinery usage level with poison and water is positive and significant correlation with none of another inputs. Among elected producer the most usage of labor related to use of it in crop irrigation, there fore positive correlation between these two inputs that has been came is based on expectation. Comparison of results in both tables (1) and (2) indicate that producers with high mechanization level also there are opposition between correlation and regression coefficient for both labor and chemical fertilizer variables , similar previous group view point of sign. Of course about labor has been seen adverse process too.

According to correlation analysis expect to be a positive relation between amount of labor and production (yield) usage. While in regression analysis it observe inverse process and coefficient rate and also statistics importance is remarkable too. About of another inputs except in case of seed input, lack of conformity is in form of contradiction in statistics importance. About input difference between coefficient of this variable in two analysis's is very high and considerable. The results of estimation of prodution function of producer with high mechanization level have been presented in table (2). In this group used water, labor and machinery inputs on producing have negative and significant effect. So it is expected that by increase of these inputs usage the production rate will decrease. Similar to low mechanization level group in here the effect of poison and chemical fertilizer inputs on canola production are positive but in this group those effect have no significant importance. Just seed input have positive and significant effect on canola production. It is essential to say that about high mechanization level group, the poison variable eliminate from pattern because of intensive Together line of poison variable with another variables. According to absolute tension to each input the highest aid related to seed input that have positive effect on production.

Total significant coefficients of estimated function indicate reduction efficiency to measure ratio. By 100% increase of used inputs it is expected that the production rate increase about 3.2 percent. By help of usage variable in function you can chase about 62% of changes in canola yield among produces with high mechanization level .Also the rate of F factor states whole model significance with 95% safety level (5% probability). Similar to estimated model for low mechanization level producers the used tests had been indicated that lack of variance anisotropy and Torsh expression result from important variables including seed water, labor and machinery obtained equal with 596, -32, -160 and 02 respectively. Therefore one unit (kg) increment in seed usage will increase in water usage, amount of 1000m^3 will decrease 32 unit in crop .Also increment in labor use amount of one day - person in one hectare will cause decrease in crop. In case of machinery more usage of machinery equal with 1000 Rials will decrease 2 kg in crop. View point of much difference among result obtained from correlation and regression relation, there were used from indices for analysis. In next part the findings have been presented that obtained from indices usage.

B) Analysis of the effect of mechanization according to mechanization indices.

In this method total value of used inputs including chemical fertilizer and poison, irrigation equipments and machinery calculated as one index and used in production function.

Formerly of presence of expression results, first estimated correlation between used variable in production function by applying of Pierson correlation coefficient. According to results of table (3) considered that there are positive and significant correlation between yield and mechanization index and seed. Also there was significant correlation between mechanization with labor and water inputs. Positive correlation between this index and used water is based on expectation. It expected that water availability to be more following more cost usage on irrigation equipments .Also based on obtained results, the most use of labor related to irrigation, so it is estimatable the existence of positive correlation between labor and mechanization index.

Table 3: Pierson correlation coefficient between variables.

Variable	yield	Mechanization index	seed	water	labor
Yield	1				
Mechanization index	0.127*	1			
Seed	0.420**	0.108	1		
Water (irrigation)	0.185	0.320*	0.222	1	
Labor	-0.218	0.673***	0.116	0.348*	1

*,**,***, significant at1,5 and10 percent respectively

Also in continuation similar previous expression by use of introduced variables in table (3) in estimated Kub-Doglass production function for producers. The results of this estimation has been came in table (4). Comparison of table (3) and table (4) specify that there are high conformity between correlation coefficient and regression analysis coefficient, in both analysis, mechanization and seed index have positive and significant effect on production level or yield. Furthermore their coefficient is closed together. Also in both table observed that water and labor variables coefficient have positive and negative effect on production respectively, that they have low statistical importance

Table 4**: Results of producers production function esthmation.**

Variable	**Y**	**Mechanization index**	**Seed**	**Water**	**Labor**	**Place illasive variable**
Coefficient	-3.698**	0.129**	0.491**	0.195	-0.278	-0.348*
Standard error	1.813	0.057	0.239	0.163	0.209	0.228
Factors	F=6.899***			R^2=0.558		

*,**,*** significant in 10,5 and 1 percent respectively.

Table 5: Pierson correlation coefficient among variables.

Variable	**Yield**	**Mechanization index**	**Seed**	**Water**	**Chemical fertilizer**	**Poison**
Yield	1					
Mechanization index	0.428**	1				
Seed	0.420**	-0.013	1			
Water	0.185	-0.181	0.222	1		
Chemical fertilizer	0.636***	0.236	0.540**	0.231	1	
Poison	0.391**	0.428**	0.340*	0.070	0.417**	1

As you see in table, mechanization variable have positive and significant effect on producer production. So increment in this index meaning an increase in index input use. By 10 % increase in above index about 1.3% will add to crop yield. Among another variable the seed input will have the highest help to production. If we increase 10 present in seed amount, the production will increase more than 4.9%. The effect water inputs have no statistic importance t00.Also labor have negative effect on producing but its effect have no statistics importance.

Place illusive variable took into consideration similar previous expression. According to this, it could to say that there is important difference between two zone view points of production condition and producing condition is more favorable. It is necessary to say that this variable can show the effect of specific effective condition that there are not investigatable by another variable. In this expression based on high correlation between cultivated area and yield for solving problem of variance heterogeneous , used from square variable of cultivated area. After using the mentioned variable the theory of variance heterogeneous was not accepted.

According to Reset Ramsy test the theory of Torsh expression were not accepted that resulting from main variable deleting. Also standard test showed that trouble sentences have normal distribution at 95% safety level.

By use of explainational variable could be able to chase about 56% of changes in production variable. F factor confirms the significance expressed pattern at 1% level too. Final profiting of seed input that have significant effect on production was obtained equal with 183.This means that applying of one additional unit of seed input can be able to add 183kg to produce crop.

In this chapter the results of Singh index use (2006) has been brought. Some of previous parts, first relation between variables by use of piedr.bf88@yahoo.comrson correlation coefficient was investigated (Table 5). Then the effect of index on production was evaluated by use of kub-Doglass production function. As you see in the table (5), the mechanization index have positive and significant effect, by producing. Chemical fertilizer and seed that in previous pattern used as partial of mechanization index in this pattern have been shown positive and significant correlation with production. Mechanization index have positive and significant correlation just with poison input. Also it has been appeared a positive but no significant correlation between mechanization and use of chemical fertilizer.

Relation between seed correlation by fertilizer and poison inputs is positive and significant.

At the end of portion the effect of mechanization index on canola production has been evaluated by production function use. The result of this evaluation has been presented in Table 6 view point of significance and direction the relation between variables and yield variables, the results of two analyses of correlation and production have conformity with each other. But view point of size about of mechanization index variable there are different between two analysis. According to correlation analysis, the changes of yield and mechanization index variables have 43% correlation approximately while regression has been evaluated analysis the aid of this variable about 69 percent.

Table 6: Results of producer's production function estimation.

Variable	Y	Mechanization index	seed	Water (irrigation)	Chemical fertilizer	Place illusive variable
Coefficient	-1.171	0.689*	0.459**	0.015	0.672***	-0.087
Standard error	1.219	0.529	0.251	0.136	0.186	0.421
Factors	F=13.561*** R^2=0.715					

*,**,***: significant at1,5 and10 percent respectively

In recent pattern it has taken profit from production function that in which they were cost of machinery use to total machinery and labor cost index ratio. Obviously help of used expiation variable have been increased. Mechanization index in this expression has been shown high effect contrary to previous expression.

In this manner by mentioned index increment about 10%, the production rater per unit will increase about 6.9%. About this high effect could be say in previous expression the labor showed the negative effect on production. While in pattern index, labor variable is used under fraction and in other words increment in this index is along with decrease in labor usage.

On the other hand correlation coefficient between adverse labor and yield production ratio was obtained positive, thus recent index showed high contribution as mechanization variable explainer .chemical fertilizer presented high contribution too. Whereas following 10% increment in use of this input, the produced crop rate will increase more than 6.7 percent. Similar increment in used seed rat would be increasing the production more than 4.6 percent too.

The water input in contrary to it had shown positive effect direction too, but its effect have no statistic importance. Also place illusive variable in contrary to previous expression, didn't show significant effect .In this expression applied explanatory variables are capable to explain more than 71 percent of production variations. F factor confirm signification of total pattern in 99% safety level too. Total profiting of pattern significant variables including seed and chemical fertilizer were obtained equal to 171 and 5.23 respectively, that mean of following 1 unit (kg) increment in seed and chemical fertilizer inputs, the crop rate will increase 171 and 5.23 kg respectively.

DISCUSSION AND CONCLUSION

Generally could to said that the used method were able to show difference between groups view point of mechanization level. Based on n analysis that in which the producers divided to two groups according to mechanization level. Even though production function analysis have little contribution to mechanization effect analysis, but comparison based on correlation coefficient was clear and obvious and could to show the distance between groups nicely.

A part from result that obtained from producing function of each groups, producers division method and procedure based on applying level of chemical fertilizer, irrigation equipments and machinery could be presented as appropriate pattern for separation the producer to two groups with difference mechanization level. Suggested index of Karter *et al* (1999) and mead (2000) have suitable ability to express the effect of mechanization and interfere more factors in mechanization on of producing. But anyhow this index showed that more use of produced inputs in industry part have positive and significant effect on production. From significance of this variable furthermore direct analysis of this index as effect of mechanization on producing, the dividing of producers to two different level of mechanization could gather.

Because of main difference produced input indices in industry part is use of poison in index calculating as compared with process that divided producers into two mechanization level. Presented index by Single (2006) have effect similar goods index effect that it is produced in industry part and appeared existence of remarkable mechanization effect on production. Similar gathered from previous index possibility of group separation could be expressed again according to mechanization level. Considerable size difference of two indexes could be known as results of difference in parts. For suggestions presentation according to separation results of groups with high and low mechanization in view of opposition among regression analysis findings and correlation, often attempted to use from correlation analysis results.

According to these research findings the following suggestion could be presented:

1. Increment of mechanization level by emphasis on input among producers.
2. Increase (decrease) use of seed (labor) input among producers.
3. Increase usage of seed, fertilizer, poison and machinery among producers with low mechanization level.
4.among producers with high mechanization level because of positive relation of machinery chemical fertilizer, poison ,seed and water with each other it is necessary to increase their apply simultaneously .
5. Among producers with high mechanization level in view of relation of other variable with yield and also between inputs is negative with the exception of seed input, thus at least could be said under current condition more use of inputs per area isn't suggest able This suggestion about scarcity of input water in view point of its high use and its probable negative effect on production have more emphasis.
6. Pay attention to ecological and local differences in mechanization effect analysis and scientific suggestions.

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