

**Land consolidation, an unsuccessful experience under government models,
but successful in the framework of indigenous knowledge¹**

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Abstract

Following implementation of the Land Reforms in Iran, Agricultural Ministry officials set about to establish joint stock companies, production cooperative units and cultivation and industrial companies, in a bid to deal with problems caused by falling crops and mounting rural emigration. They failed to succeed due to various reasons, including lack of participation and cooperation by farmers and incompatibility of applied models with the traditional Iranian rural community. These units disintegrated following the Revolution, after which in some parts of Iran, such as the Sarband area near Arak in central Iran, farmers drew on their experiences based on indigenous knowledge to bring about consolidation of highly scattered, fragmented farmlands. In this way they could remove disadvantages of their lands being fragmented without any bureaucracy and in some cases guided by agricultural experts who sought to mix scientific and indigenous knowledge. In fact, they managed to make traditional farming compatible with modern technology.

Keyword

Indigenous knowledge, land consolidation, land fragmentation, land reforms, rural areas semi-feudal system, technologies

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Introduction

The process of land reforms in Iran despite the failure to set a specified model for rural development represents a turning point in structural shake up in land ownership in the country. Besides, it failed to bring about a change to the traditional system of agricultural exploitation. In other words, if one accepts that distribution of land among villagers can be a prelude to introducing an overhaul of the social and economic structure of a community, as the first step in the process of land reforms, it will be of prime importance.

In other words, distribution of land can set the stage for progressive social development. However the ultimate objective of this process will only materialize if it is based on cohesive and long-term planning. In Iran, criticisms of land reforms argue around 4 major issues:

- 1- Land reforms are behind a rise in rural migration;
- 2- The confusion arising from introduction of change into national land structure, is to blame for a fall in agricultural production and a rise in imports of farm products from abroad;
- 3- The process is to blame for reduction of the size of agricultural units;
- 4- Following the introduction of land reforms, the family farming units drifted into oblivion.

This article does not seek to substantiate or refute these suggestions, which is a separate topic which cannot be dealt with here. However in the following lines we will try to reject some cases, such as fragmentation of land, which has its roots in ancient times and dates back to the quasi-feudal era.

One major feature of such land consolidation in rural areas is that it cannot be viewed as a promotional program to be generalized to cover other areas across the country, because of the geographical diversity of Iran. Therefore it is impossible to implement this kind of land consolidation through administrative body. The objectives of land consolidation projects were to be the following:

- 1- Making rational use of modern production equipment and tools which measures up to country's industrial sector.
- 2- Pushing up productivity per hectare through land consolidation and creation of better farming condition.
- 3- Preventing the loss of agricultural water and making optimal use of existing water resources.
- 4- Preventing the large exodus of rural population. At present, farmers leave their villages behind and move to cities because farming in fragmented agricultural lands is not economically suitable.

5- Introducing structural changes to the morphology of villages and turning tightly packed and dense settlements into sprawling ones with a fair share of health facilities and welfare.

6- Turning traditional animal breeding to industrial or semi-industrial ones with better sanitation.

7- Turning unmarked farmland into demarcated files,

8- Gradual turning of traditional methods of cultivation into marketable crops and secure better income for villagers.

Methodology

A) Statistical population

The statistical population of this survey covered the districts of Sareband, Arak. In all, there were 260 villages in the area, of which 26 were chosen for the survey; 14 villages from the district of Ghare Kahriz and Kazaz and 12 other from Sareband. In the process of selection of the villages, the following criteria were taken into consideration.

1- Relative dispersion of village and ecological situation.

2- Kind of cultivation (irrigated, dryland, or a combination of both).

Efforts have been made under the second criterion, to include all three, the villages in which irrigation farming prevails, those which exclusively depend on dryland farming and finally the villages which employ both methods. Such diversity is aimed at better exploration of motivations, objectives and rural needs as far as land consolidation is concerned.

B) Research Techniques

In this research different data-gathering tools such as: Questionnaires, interview and observation were the most important techniques which were used. Two different questionnaires were handed out for collecting specific data.

1- A 20 page village questionnaire with more than 70 items on, economic and social characteristics of sample villages. 26 of such questionnaires were completed in the process.

2- The second one was concerned with the socio-economic aspects of peasants. The sample units were 115 peasants who were chosen randomly.

The number of peasants depended on the population of village. The village questionnaire which includes up to 70 questions focuses on the features of farming families the number of land units used, the distance between the plots

and problems arising from land aggregation and so forth. In addition to these questionnaires taken out by experienced pollsters, the notes of researchers taken during observations, along with interviews, suggestions, viewpoint and references of local experts, were also taken into account before being catalogued.

C) The research problematic

This research sought to answer the following questions.

- To what extent has land consolidation pushed up yield per hectare?
- Did aggregation expand the use of modern equipment in cultivation?
- Had it led to conservation of water?
- What impact did land consolidation have on rural migration?
- What morphological changes has consolidation brought about?

Theoretical framework of the research

This article amounts to a confirmation of the viewpoints of Robert Chambers, a lecturer who focuses on rural development and a founder of development research institute at the University of Sussex. Chambers had many field studies and research-related experiences in rural development in developing countries.

He believes in the villager potentials and capabilities in the framework of what is called the indigenous knowledge. Such capabilities include accurate details, transfer of knowledge through training and verbal passing of awareness. Such a transfer in rural communities comes faster than that of advocates of rural development which usually appears on paper, or floppy disks and is kept at libraries.

That is why rural communities need such capabilities most. Of course, the indigenous knowledge of villagers is both vulnerable and adaptable. Their knowledge goes on the wane with the death of villagers, and at the same time constantly gathers more steam through observation. In fact, it is based on the following statement by Swanson "if you don't see something, how could you know anything about it?" His knowledge could be obtained through extensive application of one's experiences and common sense than the learning of a scientist. In most third world countries, the knowledge of rural people is a very important national source which is adequately utilized. As John K. Hatch puts it "the expert viewpoints of peasants are the biggest source of knowledge for development of rural economic units which have yet to be employed.

This kind of knowledge cannot be ignored anymore (Chambers P. 117). Sometimes the practical knowledge of rural people as far as agriculture is concerned, holds advantage over that of rural developers. For instance, in Tanzania, certain areas were earmarked peanut cultivate had it not been for consultation held with the locals, the peanut project would have proved a failure.

There are many cases of inaccurate agricultural research; the advice dispensed by agricultural research stations may do irreparable damage to farmers' interests. On the other hand the technical know how of rural developers holds advantage over rural knowledge because it can be analyzed with great accuracy.

Except for direct observations, the performance of rural people is not satisfactory as far as measurement and observation are concerned. Besides, the accuracy of rural developers can also be quite misleading (Chambers P.124). The reality is that development projects have suffered due to a superiority complex against the peasants. Robert Chamber says: "We believe modern technology is absolutely superior to the knowledge of peasants. That is why our research is directed as if we knew everything and those who worked for us didn't know anything at all". (Chambers P.98).

He further said: "The knowledge of villagers and modern scientific knowledge complement each other". Combination of both can lead to some success. Neither of them alone can bring success. To make a breakthrough, rural developers should climb down from their ivory towers and learn from rural people (Chambers. P.99). In the process of the land consolidation project under review, indigenous knowledge was at the centre of many measures and plans which drew on the experience of rural people, veteran farmers in particular. Suggestions and scientific experience of agriculture promoters have also been used. In other words, the process of land consolidation makes use of both indigenous knowledge and scientific experience.

Factors contributing to fragmentation of lands in rural areas

Under the heading of factors responsible for fragmentation of rural lands, political, historical, economical and social factors are investigated:

1- Political factors responsible for fragmentation of land in regions under study

A – Lack of security

Lack of security in Iranian society in general and rural community in particular could be attributed to two internal and external factors in Iranian plateau: external or foreign factors include aggression by nomadic tribes which from 10th century for 10 centuries invaded the country's border and threatened the security of the rural areas along their path. The internal factor responsible for lack of security among rural population has been the mutually unstable relations between villagers and migrating nomads during their journeys in spring and autumn in search of pastures for their cattle. The nomadic tribes migrated in spring to highland pastures and in autumn returned to flat regions and during these back and forth journey, passed through agricultural lands of villagers and triggered damages to their farms.

In some occasions fighting between them resulted in looting of villagers' cattle and properties by the nomads. Thus, lack of security while affecting the morphology of villages forced the rural population either to construct their residential units in plains or edge of desert within castles or much closed to each other. These concentrated or in castle-form places of residence which were usually near water resources was one of the reasons behind fragmentation of farm lands in rural areas and their division to small plots.

The reason and justification for fragmentation of farmlands and their division into small tracks is that if instead of giving a number of small and fragmented pieces of land to a farmer, a single and large plot of land was given to a farmer, the problem of proximity or remoteness from the village would emerge. In other words some farmers will receive lands close to the village and others will have their farm away from the residential area. With respect to the above, we can say that concentration of rural houses in certain areas, mainly because of security concerns and self defence against invaders and looters, has played a major role in fragmentation and dispersion of rural lands in Iran.

B – Maintaining the authority of landlord

Due to deep suspicion of landlords in Iran's semi-feudal society towards villagers and their long experiences in land ownership, they were aware that transfer of large and independent bulk of land to peasants might create a sense of ownership and independence among the villagers. Therefore lending large scale farmland to peasantry was not in the interest of landowners. Based on such understanding and in order to prevent any sense of ownership, in most villages throughout the country, each year the farmlands were distributed among the peasants by draw and this mechanism prevented permanent

possession of a piece of land. This meant that the land under the disposal of a farmer for a year was to be handed to someone else the next year and this would cause the villagers not develop since there was no ownership towards the land under their cultivation.

2- Socio-economic factors responsible for land fragmentation

When talking about the socio-economic factors, we can mainly refer to population growth and hereditary law as contributing factors to land fragmentation.

A – Population growth

Although due to high mortality rate especially among infants, the population growth in rural areas was insignificant but leaving the village and migration to cities did not even crossed the mind of villagers and landowners. In an effort to create jobs for their sons, the farmers redistributed the existing lands among them and this led to further fragmentation of agricultural lands.

B – Inheritance

Although in accordance with the inheritance law, upon the death of a landowner the land must be distributed among the inherits but in Iran's semi-feudal system before the Land Reform, all the lands belonged to the landlord and he would give the land cultivated by the departed peasant to his eldest son and sometime when there were more than one inherent the land was redistributed among them and this also brought additional fragmentation to farmlands. In post Land Reform era, although redistribution of land was outlawed but inheritors of deceased farmer disregarded the law and divided the land among themselves by unofficial documents, a development which caused more land fragmentation.

3- Other factors affecting land fragmentation.

In addition to factors mentioned earlier, other reasons such as poor or rich quality of soil, distance between the farmland and water sources and variety of crops for self consumption are also somehow responsible for land fragmentation.

A – Topographic and quality of soil

Agricultural lands in Iranian villages are classified on the bases of natural characteristics such as gradient, stony soil, productivity and type of soil. As

demand for high quality land is more than poor quality, the village owners in an effort to solve this problem and distribute the land among farmers fairly made sure that all peasants receive a piece of rich, stony and poor quality land. For instance, if in a village a farmer had 5 hectares of land, his land consisted of several piece of above mentioned categories. Some researches believe that this method of land distribution has its roots in a kind of collectivism in primitive societies (Kazem Vahidee, Rosta Shenasi p.86) and others attribute this method to practical experience of village owners (Vosooghi Nabizadeh, *et al*, problems of fragmentation ... p. 142). Whichever of these two assumptions are taken as the reason behind this method of land distribution, the end result is that this mechanism played a major role in fragmentation of farmlands in villages throughout Iran.

B – Proximity of lands to water sources

Since in Iranian villages water is directed to the farmland form the water sources (i.e. quants) by open canals, therefore the extent of wasted water differs due to evaporation and sinking into the ground in longer routes and consequently lands closed to the water source are more valuable than the remote ones. This factor also played role in land fragmentation.

C – Reclaiming new agricultural lands

In Iran's semi-feudal and traditional agrarian system, reclaiming new farmlands have attracted more investment and efforts than other sectors and village owners have always tried to bring additional lands under cultivation or increase the productivity of the existing lands.

By reclaiming arid lands and turning them to cultivated farmlands, the total surface of agricultural lands in villages were increased and the newly reclaimed lands were distributed among farmers and became a source of further fragmentation of agricultural lands.

D – Crops diversity for self-consumption

In the past, large portion of agricultural products were consumed by the farmers themselves and were not intended to be sold in the market. For this reason the food stuff for family consumption were grown in farmlands under the farmer's disposal. The need for diverse agricultural products for self-consumption necessitated land fragmentation so that the needed crops could be produced in different plots of land in a harvest year.

The factors mentioned in this paper as the reasons for land fragmentation in Iran's rural communities and the areas under study in particular, were the results of pre land Reform era.

Following the Land Reform, due to various reasons such as structural change in land ownership and emergence of new agricultural exploitation methods, disintegration of traditional power structures in rural communities, replacement of old system of management of landlords with new management, gradual move from traditional farming based on self-consumption to commercial and profit making farming, application of new cultivation technologies and deep desire for independence in farming activities, created by increased ownership incentive, brought about new conditions in rural areas. These developments were accompanied by further fragmentation of rural lands and consequently factors which were considered as useful and appropriate in the past became inappropriate and an obstacle on the way of development.

Faced with these problems, both farmers and concerned authorities embarked on a major effort to tackle the newly emerged situation and since the state and the semi state organized collective farms in past land Reform era failed to achieve the foreseen objectives, with the help of new methods based of farmers self-assistance and indigenous knowledge, a new campaign was launched for land consolidation.

Hereinafter, we review the socio-economic problems caused by land fragmentation in post Land Reforms era, problems which the present petty land owners and yesterday's landless villagers in Iran's rural areas are currently facing.

1- Problems caused by introduction of farming machineries in villages

Although the introduction of tractors and other farming equipment in villages in very limited scale dates back to pre land Reforms period which were somehow welcomed by some village owners but application of agricultural machineries and equipment in large number started after land Reforms and Revolution in particular. The increase in the number of tractors in rural areas especially in post Revolution era is shown in the following table.

Table 1: number and percentage of tractors in village under study before and after the Revolution

Period	Number of tractors	Percent
Before revolution	61	22.3
After revolution	213	77.7
Total	274	100

Source: Vosooghi, Nabizadeh *et al* p. 163

In parallel to introduction of tractors to rural areas, use of other agricultural machineries also increased. In villages covered by this research, Farmers used a large number of tools such as disk, cultivator, harvesters and rollers.

According to the result of field studies, 60 percent of farmers used cultivator for mixing of fertilizer and seeds and 50 percent made use of harvesters. Figures obtained by this study show that despite the influx of agricultural machineries into villages covered by this study, because of land fragmentation and small size of the farmlands, the traditional agricultural system in Iran has not been able to adopt itself to the new technologies and make full and extensive use of them. In the years following the Land Reforms and specially the Revolution, along with agricultural machineries, use of various transportation means also increased drastically.

The following table shows the number and percentage of the transportation means in 26 villages covered by this research in pre and post Revolution.

Table 2: the number of motorized vehicles sampled villages

Period	Lorry	Percent	Pick up	Percent	Sedan	Percent	Minibus	Percent
Before revolution	21	24.70	24	11.88	1	3.03	3	13.04
After revolution	64	75.30	176	87.12	32	96.91	20	86.96
Total	85	100	202	100	33	100	23	100

Source: Ibid p. 174

The above statistics become more meaningful if we realize the total number of transportation means in post Revolution era covers only a period of 8 years while the period in pre Revolution extends for 17 years.

The figures given in the table 4 also indicate that the number of transportation means in post Revolution period have increased significantly and the percentage of lorries has gone up by 305 percent, sedan cars 3100, percent and motorcycle by 339 percent and the overall increase of motor vehicles in post Revolution has increased by 392 percent compared with period before the Revolution.

With respect to points made about the introduction of farming machineries and equipment and various means of transportation into the rural communities in Iran, we now review the inconsistency of the traditional structure of rural community with the new technological structure and problems created by this incompatibility.

2- Problems with application of tractors to small tracks of land

Obstacles which hinder the use of tractors in small plots of land could be divided into two categories. First lack of access to roads for tractors, in order to reach small farmlands, and second lack of adequate space for tractors to manoeuvre properly. Concerning the first problem, since each farmer in average had 44 pieces of land, if before land consolidation wanted to plough his land by tractor, had no choice but to run the tractor through the lands of other farmers to reach his own farm. This problem is actually prevailing among the village under study and that's why in all agreements concluded for land consolidation an 8 meters wide passage road is foreseen for tractors and other transportation means.

Another problem created by incompatibility of modern technologies with small and fragmented farmlands is that tractors with their huge tiers destroy the boundaries separating each plot of land. Those areas which are run over by tractors become very hard and lose their productivity. By plough and destruction of boundaries, cobbles and the seeds of weeds scatter within the farm and contaminate the crops. Movement of tractor within the small scale farmland creates additional problems. Tractors while turning round at the beginning and the end of small farmlands leave a surface 6 to 8 meter wide untouched and naturally unutilized.

Based on results of field studies in 26 villages nearly 33 hectares of land due to lack plough by tractors could not be brought under cultivation and this is a problem which is caused by used of tractors in small farmlands. In addition to aforementioned problems, plough of small scale farmlands is a time consuming

job and each year, farmers lose a considerable amount of their working hours to plough such farmlands.

Accessories such as seeding plough which is attached to tractor, increases its length and cause further problems for farmers who use tractor to plough their lands, something which I could not go into details in this paper.

As mentioned earlier, one of the main problems caused by land fragmentation in the villages covered by this study is the waste of irrigation water in main and secondary aqueducts when farmlands are located in remote areas. Long distance water flow, results in water loss because of following reasons:

- Wasteful running of water in secondary watercourses.
- Penetration and ingestion of water into the ground along the route before reaching the actual destination.
- Evaporation of water along the route.

3- Loss of agricultural labour force

The traditional farming based on small and fragmented lands requires more manpower for cultivation in comparison with consolidated lands because in traditional agricultural activities, farmers spend considerable time to reach their scattered lands and for irrigation also face similar problem because irrigation of small farmlands located in long distance from the water source, requires more irrigator than large scale and single piece of land. Transportation of fertilizers, seeds and agricultural products to fragmented and remote farms requires more manpower to handle than small and fragmented lands.

4- Increased wear and tear of machineries

Movement of tractors, transportation means and other agricultural in scattered and rough lands and running through land boundaries, crossing main and secondary watercourses and finally collision of the vehicles and machineries with natural obstacle cause their breakdown and early depreciation.

5- Fragmentation lands a hindrance for Implementation of development projects

Implementation of projects such as industrial animal farming, poultry, modern gardening, levelling of lands, and drainage and so on in small and scattered lands is neither possible nor economical and this is one of the main deterring factors which prevents agricultural development.

6- Farming in small and scattered lands is not economical

Since the small and fragmented lands are inline with self-sufficient way of living, therefore consolidation of these small units and turning them to large scale commercial farms and supply of their products to consuming markets is not easy and couldn't meet the present day needs of farmers.

7- In small units of land effective pest control is not possible

As farmers grow different crops in their small farms, then using pesticide in a wheat farm next to a farm under tomato cultivation is not possible because each crop needs different pesticide and a pesticide appropriate for a certain crop might be harmful to the neighbouring farm.

8- Introduction of machineries as a source of increased conflict between farmers

Passing of tractors through the farms of neighbouring farmers, destruction of boundaries and similar issues are source of clashes between the farmers and in some occasions such quarrels end up in bloody fighting among villagers. With respect to problems cited for incompatibility of modern and traditional farming it is natural that traditional farming to lose its efficiency specially in the last two decades and prevents incentives for consolidation of lands in Iranian village to gain momentum and the consolidation process in an spontaneous manners and based on indigenous knowledge and guidelines given by agricultural expert is gradually taking root in villages under study.

Incentives for land aggregation

Incentives for land aggregation among the farmers under study with respect to introduction of modern technologies and its incompatibility with traditional farming in post Revolution era could be review in connection with following factors:

1- Impact of modern technologies on supply of irrigation water

As reminded earlier, before the Land Reforms one of the criteria used in evaluation of lands was their proximity or remoteness to the only source of water called *qanat*. As stated before the semi-feudal system in Iran, in order to bring about a somehow fair and just mechanism for distribution of farmlands among the farmers, divided the good and poor lands into small plots and transferred both good and poor quality lands to each farmer. Nowadays the

problems of remoteness to water source is to a large extent solved by drilling deep and semi deep wells in various spots throughout the village and this is no more a determining factor for land consolidation. Results of the current study show that the number of deep wells drilled for supply of irrigation water has increased drastically in post Revolution period.

Table 3 shows the growing number of such well and reduction in the number of *qanats* due to their abandonment or lack of dredging.

Table 3: Increase of irrigation wells in recent years in 14 villages in Qara Kahriz and Kazaz rural regions

Type of source Period	Spring	Water sources			Qanat
		Deep	Semi deep	Manual	
Before the Revolution	9	5	1	1	17
After the Revolution	8	56	4	34	13
difference	-1	+56	+3	+33	-4
Percentage of Increase or decrease	-11.11	+1020	+300	+3300	-29.41

As shown in the above table, within the 9 years since the Revolution, 51 deep wells, 3 semi deep and 33 manually dug wells have been drilled in 14 villages covered by this study and therefore the water shortage parameter which contributed to land fragmentation and scattering have been largely removed and tendency towards land consolidation have grown higher among the farmers.

2- Influx of tractors to villages and its impact on increased tendency towards land consolidation

Another factor which has left great impact on tendency towards land consolidation is the harmful effect of the use of tractors in small lands and at the same time advantages of their application and other machineries in large and consolidated lands. Result of the study show that out of 105 farmers interviewed about the use of agricultural machineries, 100 or 95 percent of them has used tractors and 83 percent have employed other agricultural machineries in their farming activities. Farmers say that application of tractors and other machineries are only possible in large and independent farms. Our studies show that the sooner the farmers became familiar with the advantage of application of tractors into their lands, the earlier they started their efforts for land consolidation (table 4).

Table 4: comparison of introduction of tractors and the year which farmer in sample villages started land Consolidation

Name of the village	Tractor introduction year	Land aggregation year
Eskan	1975	1980
Bazneh	1973	1977
Housein Abad	1979	1979
Qoosh Tapeh	1981	1984
Far	1970	1980
That Mahal	1977	1982
Tooreh	1976	1979
Mahdi Abad	1969	1972
Basri	1970	1981
Qiz Ghayez	1969	1979
Baajgiran	1984	1985
Zalian	1978	1981
Hendodar	1963	1971

Results of the land consolidation process in villages under study

Earlier, we discussed the idea of land aggregation by the government in the framework of agricultural farm corporation, production cooperatives and collective companies after Land Reforms. As these companies were set up, the idea of land consolidation gained ground among farmers in some villages. Peasants in villages such as Hossein Abad, Mehdi Abad, That-e Mahal and Hesar implemented it independent of government, integrating numerous pieces of land they owned as a result of Land Reforms through their own initiative thus, they managed to reduce the number of pieces from, say, 50 or 60 to two or three. A number of researchers have termed land consolidation in this manner

with no government intervention and a pre-determined modal “incomplete land consolidation” (Vosooghi, Nabizadeh, et al p.221).

However, the land consolidation program was implemented in a fairly consistent way after the establishment of “the Toureh agricultural rural and nomadic services enter” by the agricultural experts of Agricultural Ministry following Land Reforms in the area under study. In total, out of 14 villages that carried out land consolidation in the sample under study, lands in 8 villages were integrated by the villagers themselves and in 6 villages by the aforesaid centre.

The following table shows the number of land pieces before and after consolidation:

Village	Number of pieces before aggregation	Average number of pieces after aggregation	Percentage of farmland
Eskan	32	5	3.5%
Bazeneh	13	2	20%
Hesar (marqzar)	29	8	3.2%
Hesar (Aliabad)	33	8	8%
Farr	66	4	3.8%
Ghosh Tappeh	88	2	21.1%
Tahtemahal	68	9	1.3%
Toureh	50	5	8.9%
Hossein Abad	34	4	2.6%
Mehdi Abad	29	4	60%
Basari	112	6	2.3%
Ghayez	20	4	7.2%
Bajagiran	10	2	2.8%
Zalian	27	8	7.7%
Hendudar	17	10	6.9%

Source: Vosooghi, Nabizadeh *et al* (p.222)

Outcome of consolidation

1- As could be seen in the table above, the villagers have managed to reduce the number of their pieces of farmlands to as low as possible with their own cooperation and guided by the services centre, thus overcoming many problems caused by fragmented land.

On the other hand, as the table shows, the area of farmland has increased in villages under study as a result of consolidation. The increase could be explained by the removed of boundaries among pieces of land, a reduction in secondary aqueducts and addition of those small, scattered areas that tractors could not plough. It is noticeable that the amount of land increase which totalled some 1517 hectares in the 14 villages were recorded with no additional cost and without any field work, including land levelling, digging, drainage removal of cobble stones and cleaning.

Stopping water waste

Land aggregation has contributed significantly to an increase in farming water and decrease in water waste due to the following:

A- Diminishing water evaporation as a result of reduced number of main and secondary aqueducts.

B- Shortening long distances

C- Increasing irrigation frequency in farmlands.

Economizing agricultural labour force

Savings made on labour force after land consolidation can be explained by the following two factors:

A- Cutting down on time: A farmer has to travel lesser distance with less frequencies a day in order to reach his land. Studies show land consolidation brings about 1.2 to 3 man-days per hectare a year.

B- Overall, in villages studied, more than 62 percent of labor force in irrigation was cut down. The table 6 shows the fact.

Village	Farmland in hectare	Workers needed for irrigation in a dang		Decrease in number of workers after aggregation		Percentage of Decreased after aggregation
		Before	Village	Piece	Village	
Eskan	316	6	2	4	24	66.7%
Bazeneh	561	12	4	8	56	66.7%
Hesar (marqzar)	198	5	1	4	24	80%
Hesar (Aliabad)	316	8	2	6	36	75%
Farr	269	4	1	3	36	75%
Ghosh Tappeh	86	2	2	—	—	—
Tahtemahal	185	7	1	+	34	86%
Toureh	422	8	2	6	48	75%
Hossein Abad	119	3	1	2	12	67%
Mehdi Abad	80	2	1	1	6	50%
Baajgiran	633	12	5	7	56	58%
Ghayez	369	3	1	2	48	66.7%
Bajagiran	118	5	3	2	12	40%
Zalian	462	7	5	2	12	28%
Hendudar	330	6	3	3	18	50%
Total		90	34	56	412	—
Average						62.2%

In traditional Iranian agricultural system, a farmland is usually divided into 6 equal parts with land lying in each part being called a “dang”.

As can be inferred from the table, there is a considerable decrease in number of irrigation workers after land consolidation and this is a significant result of consolidation in the area under study.

In fact, freeing a considerable amount of time of the existing labor force in a village can mean start of new activities or increase in secondary activities by farmers among the sample population.

Cutting down on tractor and other machinery costs

The fall in the tractor and other machinery costs can be accounted for mainly by reduced distances, broadened tractor manoeuvring space and its relative speed increase as a result of moving in larger track of land; a reduction in depreciation costs, an increase in its working life and generally speaking, its increased productivity. Studies show a 10-50 percent drop in machinery maintenance and 30 percent drop in depreciation costs in sample villages. The following table indicates a 10 percent rise in the performance of a tractor, with its mileage rising from 44.1 hectares before consolidation to 48.5 hectares after consolidation.

Table 7: Performance of a tractor before and after consolidation in sample villages

No. of tractors	Farmland in Hectares		Performance of tractor Per hectare		Percentage of increase
	Before	After	Before	After	
231	9318	10352	44.1	48.5	9.97%

Studies show in addition to reduced tractor costs, there has been a decline in transportation costs as a result of shortened distances and concentration of farming works in a consolidated area.

Land consolidation and increase in yield per hectare

Although increased performance and agricultural yields can be explained by such factors as investment rate, digging deep wells, drainage, making cement canals, using modified seeds, purchase of transportation vehicles and tractors which have been applied since Revolution with cooperation of the rural services centres, land consolidation is among factors leading to increased performance due to the following:

- Increased farming water for reasons explained earlier.
- Increased machinery performance in such works as plough, planting seeds, irrigation, pruning, harvesting, using fertilizer, etc.
- Relatively more labor force.

Results of this study suggest crop after consolidation rose from 1.5 tons per hectare to 2 tones per hectare, an increase of 47 percent. The figures have been seen in villages where consolidation has taken place. On the whole, one could

suggest that consolidation has had fascinating impacts on the sample under study, so much so that one could claim; implemented nationwide land consolidation pattern can bring about rapid economic growth in the agriculture sector. The initiative is local and based on farmers' own experience and this is one of its advantages.

Thus one may infer it will not be doomed to failure like joint stock companies, farming and industry units and collectives. In other words, its success and continuity are guaranteed by the key role played by people in implementation of consolidation which means rural masses act as its major agent.

Step-by-step consolidation

The step-by-step process adopted by the experts of the agricultural and rural services centre with active participation of villagers is as follows:

1- Choosing local leaders or pioneer farmers, in order to engage and encourage them to cooperate in implementation of consolidation.

2- Drawing up a list of farmers, the extent of their land ownership.

3- Calling on local leaders to encourage farmers to take part in land consolidation process.

4- Familiarizing a group of farmers with disadvantage of small fragmented pieces of lands as well as advantages of consolidation and informing the public about the implementation procedures and presenting a time table for consolidation process.

5- Calling on farmers to appoint a representative in each farming block or "dang" and authorize him to follow up consolidation schemes.

6- Holding frequent meetings with farmers' representative in order to determine the number of land units each farmer should have, irrigation method and water distribution, demarcate paths among farmlands and mark local road network after consolidation. All council members should sign up to the decisions taken in the meetings.

7- Once the number of consolidated lands and their limits are demarcated on paper the farmers are informed and any correction will be carried out if approved by the representative council.

8- Holding a draw for consolidated lands with all farmers in attendance and registering the consolidation process.

9- Passing on consolidated lands after draw to owners of each dang.

The 9-step process that is validated by the experiences of the researchers who conducted the study as well as promotional activity in the area under study

can be useful only if modified in the case of single village in keeping with its topological, socio-economic features.

Conclusion

Implemented on the advice of the UN when land reforms programs were under way in the third world countries in the 1960s, the Land Reforms in Iran were basically intended to guarantee development objectives in a bid to end the historical and geographical isolation of the Iranian rural community and bring it to the fold of national community.

The economic objectives of the Land Reforms can be summarized as follows:

- Increasing the purchasing power of villagers, developing real markets for industrial goods, raising agricultural productivity and employment of extra labor in urban industries (Azkia p. 110).

Its social objectives sought to abrogate the master subject relationship (semi-servage relationship compared with western Feudalism). However, the most important objectives were political, sought by the authorities, therefore during and after the implementation of the Land Reforms, their political objectives overshadowed other economic and social consideration. In fact, the monarchy tried to cement its rule by augmenting the role of the ruling class in helping dispossessed villagers. As a result, since the Land Reforms in Iran topped the agenda and economic goals received less attention, the latter failed to materialize, and issues such as increased yield of crops, scattered lands and the like were virtually ignored.

It was only after the implementation of first phase of the Land Reforms that the country's planners began to address governmental or semi governmental collective models such as agricultural joint stock companies and cooperative cultivation and agro-industry.

Given that during the Land Reforms, the lands large landowners had been distributed among villagers in the same scattered, fragmented pattern of traditional utility system, the collective and cooperative models failed to secure the confidence and participation of villagers.

Therefore, production cooperative did not experience much growth, while the agricultural joint stock companies were dissolved immediately after the Revolution villagers resumed cultivation of their pieces of land independently.

The idea of land consolidation in the form of traditional farming units based on local knowledge, which is the subject of the current study, dates on local knowledge, which is the subject of the current study, dates back to the post Revolution years. It originated after the Land Reforms when farmers who owned numerous scattered pieces of land were exposed to modern agricultural technologies and the need for diversified farming and switch from self-

sufficiency based traditional farming to commercial farming. They found out the solution to the obstacles was to forge agreements for consolidation of their own lands without having to transfer their own lands to a governmental or semi-governmental organization or undertake any commitment to the government.

In the past, the traditional agricultural system used to be coherent for many reasons, including agricultural soil variety, topography of lands, common water source, farming sequence, the distance between farmlands and settlements, ploughshare, the distance between water source and farmlands, economy of living based on self-sufficiency, scattered and fragmented lands. However, modern technologies and farmers' tendency to break from economy of living and follow commercial farming caused the traditional ancient farming system to not only lose its efficiency in the face of machinery and new situation induced by modernism, but to be considered a big obstacle in the way of agricultural development. In fact, the movement of farming machinery was not possible in small, scattered pieces of land and these accounts for the fundamental problem of traditional agriculture, which is the second major problem of Iranian agriculture after the water shortage.

In addition to its incompatibility with modern technologies, diffusion and fragmentation of lands caused other problems for the agricultural sector, the most important of which are as follows:

- Lack of opportunity for implementation of development plans on a large scale.
- Waste of agricultural labor force time.
- Increased depreciation of machinery.
- Non-cost effectiveness of farming in small, scattered lands.
- Ineffective fight against pesticides.
- Strained relations and squabbles among neighbouring farmers in small lands.

Findings of this research suggest that out of 26 villages studied, lands in 14 villages were consolidated by the time the research was conducted. Out of those villages, 8 villages had their lands consolidated by farmers themselves, helped by the services centre, and drawing on local knowledge and experiences. In these 14 villages, farmers have been able to lower the number of their lands under cultivation through consolidation, thus overcoming many problems caused by scattered, fragmented farmlands.

On the whole, the results of the consolidation can be summarized as follows:

- Increase in lands under cultivation: The increase in lands under cultivation estimated to be about 1017 hectares in the 14 villages studied could be accounted for by removal of borders among land pieces, a reduction in the number of secondary aqueducts and addition of those parts of land inaccessible

earlier by tractors. It is to be noted that the land increase was realized without any cost and systematic development activity, such as drainage, land levelling, digging and cobbles clean up.

- Reduction in water waste: After the land consolidation in villages studied, the amount of waste water has fallen for reasons, such as a drop in water evaporation as a result of shortened main and secondary aqueducts and an increase in irrigation frequencies in lands under cultivation.

- Economizing on agricultural labor force: Economizing on labor after consolidation can be explained by saving time, cutting down on irrigation labor force and a fall in tractor and other machinery costs.

- Rise in yield per hectare: Another outcome of land consolidation validated by this research is a rise in yields per hectare.

Research findings indicate crop yield after consolidation have risen from 1.5 tons per hectare to 20 tons per hectare.

According to the conducted research, the crop yields per hectare can be associated with the following:

- Increase in amount of irrigation water.

- Increase in agricultural machinery efficiency with regards to activities such as plough, planting of seeds, irrigation, pruning, harvesting, using fertilizer, etc.

- Relative increase in agricultural labor force.

Generally speaking, the results of consolidation in the sample under study can be said to be amazing, to the extent that one can claim should land consolidation model be applied nationwide, it will cause rapid economic growth in the agriculture sector. An advantage of this kind of consolidation is its local nature based on indigenous knowledge and experience of farmers. That's why it will not suffer the fate of doomed projects like agricultural joint stock companies and collective companies.

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