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Thailand's Large-Scale Farming Model: Problems and Concerns

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ABSTRACT

Thailand recently has launched a program called "large-scale farming model" aiming to improve production efficiency and competitiveness by reducing production costs, increasing yields, and aligning production with market demand. The program, however, has experienced several problems that can severely undermine its future prospects including lack of well-rounded managers, land fragmentation, poor water management, weak governance, farm debts, enticing benefits in short run, and equity issues. Only weak evidence was found to support the implementation of the program. In fact, economic theory and empirical evidence across the globe have confirmed the existence of inverse farm-size relationship which explains the dominance of family-owned farms as an efficient mode of production. Moreover, economies of scale were found to exist only for large farms with vertical integration in the value chain, particularly in plantation crops such as sugarcane and palm oil. The fact that most of the program participants are rice farmers have contrasted and contested these empirical evidences commonly observed across the world. Alternatively, the government can expedite the process of land enlargement through a set of policy tools capable of stimulating growth in non-agricultural employment by which more agricultural land will be released into the market. In addition, the promotion of land sale and land rental markets possibly through the revision of certain legal frameworks is needed.

Keywords: large-scale farming, economies of scale, land fragmentation, farm size

INTRODUCTION

In 2015, the Ministry of Agriculture and Cooperatives of Thailand has launched the first phase of a newly initiated program called "large-scale farming model." The program will support the Agricultural and Cooperative 20-year strategy formulated as part of the Thailand's recent 20-year strategic plan (2017-2036), consisting of reforms dealing with economic stability, human capital, equal economic opportunities, environmental sustainability, competitiveness and effective governance (FAO, 2018). The main objective of the large-scale farming model is to improve production efficiency and competitiveness by reducing production costs, increasing yields, and aligning production with market demand. To achieve this, farmers with adjacent land plots are incentivized to form a group whose collective production and marketing plans are administered by a plot manager.

The government argues that, prior to the implementation of large-scale farming model, improving production efficiency and competitiveness has been difficult due to the dominance of small-scale farming in the agricultural sector. The prevalence of many farmers with small landholdings leads to several undesired outcomes that obstruct agricultural development. These outcomes include high labor cost, low bargaining power, and low rate of modern machinery and technology adoptions, which consequently cause chronic poverty and economic instability for many farm households (ACPM, 2016).

Arguably, the government's underlying reasons for the program's initiation seems to lack theoretical and empirical support or weak at best, posing several problems and concerns both in the short and long run. For example, several critics have challenged the reality of finding an ideal manager capable of supervising mass production and executing profitable marketing strategies. In addition, the flaw in governance and benefit structure has excluded some farmers from the program while the participation rate has declined in some areas.

The assessment of the program performance is crucial for policy recommendation. This article will provide an update on the progress of the large-scale farming model as well as addressing problems and challenges facing the stakeholders with some relevant theoretical and empirical perspectives.

LARGE-SCALE FARMING: THEORY AND EMPIRICAL PERSPECTIVES

Proponents of large-scale farming have argued that this mode of production is more productive than small-scale farming primarily because of its advantage in economies of scale, which describes competitive advantage that large entities have over small entities. In agriculture, economies of scale often involve positive relationship between farm size and average cost production. Large farms are typically assumed to be associated with use of large machines, better access to capital and credit, increased bargaining power in input and output markets, stronger incentives to adopt new technology, and the ability to self-provide infrastructure and services (Morris, Binswanger, and Byerlee, 2009).

The empirical evidence from developed countries suggests that the presence of economies of scale average cost function typically results in an average cost function having an L-shape: average cost tends to decline for small farm sizes, and then reach a lower plateau for average to large farm sizes (Hallam, 1991; Dawson and Hubbard, 1987; Hall and Leveen, 1978). This suggests the existence of economies of scale for small farms, no evidence of diseconomies of

scale for large farms, and a wide range of farm sizes where average cost is approximately constant. Knowing the shape of the average cost function allows the determination of minimum efficient size defined as the smallest farm size that can capture the benefits of economies of scale. This information is particularly relevant for the evaluation of the efficiency of farm structure and land reform policy (Chavas, 2008).

Despite scale disadvantages, family farms are more prevalent than large-commercialized farms due to family labors' greater incentive to work hard relative to hired labors and better management when operating under heterogeneous production environment, such as soil quality and highly variable weather conditions. This means farm level agricultural production (primary production) is normally subject to diseconomies of scale (Morris, Binswanger, and Byerlee, 2009). In fact, several empirical studies suggest that agricultural production is not characterized by significant economies of scale with the exception of plantation crops and perishable products, such as sugar, oil palm, tea, bananas, and many horticultural crops grown for export. These crops need to be quickly processed and/or transferred to cold storage facility in order to avoid rapid declines in quality and hence value. Although evidence from several countries has suggested that agricultural production are managed by owner-operated farms, with increases in farm sizes largely driven by rising non-agricultural wages, recent development in technology may increase the advantages of large farms and of vertical integration in the value chain (Binswanger and Rosenzweig, 1986; Deininger and Byerlee, 2011).

Besides economies of scale, farm-size productivity relationship is another highly disputed issue. Theoretically, by assuming perfectly functioning input markets and constant-return-to-scale production technology, farm size has no impact on production efficiency. Labor-to-land ratio will be equalized regardless of farm size. In reality, however, labor market, land market, and other factor markets are not fully effective. As a result, family farming employing mostly family labors is a preferred mode of production as the principal-agent problem associated with monitoring cost of using hired labors can be avoided. In this case, small farms are more efficient than large farms and hence the inverse farm-size productivity relationship exists (Feder, 1985; Bardhan and Urdy, 1999).

In recent years, however, some empirical studies have suggested that the relationship between productivity and farm size can take several forms depending on the thresholds defining farm size. Specifically, the relationship between productivity and farm size is positive for small farms, negative for middle-size farms, and positive again for large farms. Hence, the implementation of efficiency-enhancing and redistributive land policies should take into account the existing relationship between farm size and levels of agricultural productivity (Deininger and Byerlee, 2011).

THE IMPLEMENTATION OF LARGE-SCALE FARMING MODEL

Large-scale farming program aims at building collaboration and cooperation among farmers who produce the same products in the same area or community. The farmers' plots do not necessarily have to be adjacent to one another. They only need to be located in the same community. Hence, the term "large-scale farming" used here is quite misleading and contrasts to the definition commonly used elsewhere. The cooperation typically takes a form of agricultural cooperative or community enterprise. Farmers pool together their registered lands in order to gain economies of scale mainly through lower input prices and machinery equipment sharing. Knowledge sharing

and collective planning among group members also extend their marketing channels to various market destinations including hypermarkets and modern trade. This is indeed a significant improvement in supply chain management which in effect solves the demand-supply mismatch.

The application process is simple. First, farmers have to form a group with a clear organizational structure (e.g. plot manager and group committee), member information, and production plan. Second, the farmer group submits an application to any agricultural office in their respective areas for approval. The program committee, consisting mainly of local government officials from the Ministry of Agriculture and Agricultural Cooperatives, will verify the eligibility of the applicants according to a set of criteria and then conduct a further inspection and evaluation on site. Once approved, the information submitted will be entered into the database of the large-scale farming program administered by the Office of Agricultural Extension.

To be eligible for the program, each farmer group must satisfy a set of requirements including minimum land size, minimum participants, and product types. Specifically, every member of the group must produce the same products to the extent that each plot is located in a close proximity to the others. Currently, the program only supports three types of products; 1) rice, crops, palm oil, and rubber trees, 2) fruit trees, vegetables, flowers, and herbs, 3) aquaculture, livestock, and certain insects. For the first group, the collective land size must be at least 48 hectares with at least 30 members. The condition for the second and third group requires either having minimum land size of 48 hectares or at least 30 members

Upon verifying the eligibility of applicants, the program committee will evaluate the feasibility of the production plan using available data and field inspection. Several factors are taken into consideration. First, areas under consideration must be geographically suitable for a production of the selected products, which can be determined by soil and weather condition according to the recently developed database called “Agri Map”. Second, the volume of production must be sufficiently large to gain economies of scale. Third, the farmer group must use appropriate technology and innovation to assist the development of production process. Fourth, market destinations for products must be secured and have a potential to expand. Fifth, there is adequate water supply in the production areas. Sixth, usage of machinery equipments and development of infrastructure (e.g. drying, sorting, and milling facilities) are required. Seventh, products receive inspections and certifications (e.g. good agricultural practice – GAP). Eighth, clear objectives and a solid business plan are needed. Ninth, a plot manager must have an ability to supervise and execute production plan (ACPM, 2016).

THE PROGRAM’S CURRENT OPERATION

The program expects to see the registration of 14,500 plots with a total of 14.4 million hectares by 2046. Together with other programs initiated under the Agricultural and Cooperative 20-year strategy, the government expects an increase in a per capita income for farmers from 56,450 baht to 390,000 baht (1,800 USD to 12,580 USD) in the next 20 years. This seven-fold increase in annual income is extremely difficult to achieve without a drastic shift in the adoption and adaptation of modern technologies (Poapongsakorn and Chokesomripol, 2017).

Table 1 shows the operation of the program in 2016. There were 600 plots in total which cover 1,527,128 rai of agricultural land across the country. Comparing to other products, rice plots account for 61% of the total areas while the number of rice farmers account for 66% of the

program participants. The high participation rate may reflect the inefficiency of rice production that brings in small-scale farmers. The program itself is policy bias towards rice farmers who appear to operate in the sector with the least technology development.

Table 1. The Operation of large-scale farming model in 2016

Product	Number of Plots	Area (rai)[a]	Number of Farmers	% Cost Reduction	% Yield Improvement
Rice	381	944,718	63,741	19.0	13.0
Crops	83	169,362	9,384	22.7	27.8
Perennial	20	283,965	7,751	14.9	18.7
Vegetable	20	11,806	2,592	16.5	30.2
Fruit Trees	51	62,019	6,674	15.7	15.4
Mulberry	3	834	382	10.0	10.0
Orchids	1	607	33	10.0	10.0
Livestock	23	25,018	3,638	5.2	15.7
Aquaculture	18	28,799	2,070	8.6	8.1
Total	600	1,527,128	96,265	122.6	148.9

[a] 1 rai = 0.16 hectare

Source: ACPM (2016)

The last two columns of the table represent the expected cost reduction and yield improvement following the farmers' program participation with 2016 as base year. For example, rice yield is expected to increase by 13% while its production cost will fall by 19%. These numbers are strikingly high given that the improvement in yield and production cost in previous years has been stagnant as shown in Tables 2 and 3.

The results from Table 2 indicate that rice production has experienced some variability in cost of production from year to year. On average, the production costs have marginally declined; the five-year averages of cost reduction are approximately 2.37% and 5.78% for in-season and off-season rice production, respectively. From Table 3, the improvement in rice yields has been modest with the five-year average yield of off-season rice which slightly increased by 1% while there was a small decline in the average yield of off-season rice around 1.60%. Given these modest changes in yield improvement and cost reduction, it is unlikely that the government will be able to achieve its targets in a very short time without any kind of subsidy.

Table 2. Average cost of rice production (baht/ton [a])					
Production year	2013/14	2014/15	2015/16	2016/17	2017/18
In-season rice	10,705	11,409	10,137	9,298	9,611
Off-season rice	9,317	8,990	7,947	7,345	7,312
[a]1USD is approximately 31 baht					
Source: OAE Annual Reports 2016 and 2018					

Table 3. Average rice yield (kg/rai[a])					
	2013/14	2014/15	2015/16	2016/17	2017/18
In-season rice	436	432	419	430	408
Irrigated	574	566	552	563	548
Non-irrigated	390	387	373	385	359
Off-season rice	642	632	605	633	666
Irrigated	663	652	621	651	685
Non-irrigated	601	598	574	589	622
[a] 1 rai = 0.16 hectare					
Source: OAE Annual Reports 2016 and 2018					

PROBLEMS AND CONCERNS

Lack of plot managers with well-rounded skills, land fragmentation, poor water management, farm debts, weak collaboration among group members, enticing benefits in the short run, and inequality are some of the keys problems facing the government while implementing the large-scale farming model. Despite the government's effortless attempts, numbers of farmers have shown no interest in participating in the program while some have already quitted after a short involvement.

Lack of well-rounded managers

Finding a well-rounded manager is a major concern of the program. It is very difficult to find a skilled plot manager who can supervise both production and marketing plans, especially when there is no reward or compensation for such individual. The director of agricultural office in each district is currently assigned as an interim manager in the respective district. The government's long-term plan, however, is to get farmers involved in the management activities and necessary trainings so that some of these so called "smart farmers" can replace the interim bureaucratic manager.

Land fragmentation

In fact, achieving economies of scale is one of the key promising outcomes of the program. However, several factors and conditions can prevent or offset the realization of such gain. In principle, economies of scale arises from indivisibilities of inputs such as tractors, management skills, and fixed transaction costs in the provision of credit and insurance where intertemporal markets are imperfect. The effects of these factors on production cost correspond to an initial segment of declining average costs of the production function (Deininger, 1993). In the case of the large-scale farming model, land fragmentation is likely to impede the adoption of machinery and the utilization of management skills. To counteract the drawback on machinery adoption, the government has laid out several strategies to induce economies of scale such as providing a preferential loan rate of 1% from the Bank of Agriculture and Agricultural Cooperatives (BAAC) to the program participants. The result, however, is quite disappointing as only 53 of total 381 groups applying for the loans were granted the loans while the rest was rejected (DOAE, 2017). The main reasons for the disapproval include lack of concrete business plan, lack of hierarchical structure in the organization, weak governance structure, and lack of trust for joint collateral. For these reasons, the program may not be able to induce economies of scale as the government has expected.

Poor water management

Water constraint poses a significant challenge for collective farming as each farmer always has an incentive to start his cultivation when water becomes available. Postponing the cultivation until the designated time is risky and could be very costly if water eventually becomes scarce. Water management is even more difficult when the program's operating lands are fragmented. The fragmentation exists because several parcels of lands, especially those located in irrigated areas of the Central Plain, were grabbed by large firms and sometimes used for non-agricultural purposes. The higher degree of land fragmentation means the larger spatial dispersion of the production process, resulting in higher risks associated with the micro-variations of the natural environment and higher costs of supervising and monitoring. The gain from economies of scale will also reduce if it exists at all.

Weak governance

Weak governance structure can harm the program's member retention rate. The program membership is flexible because the participation is voluntary and free while exiting at will incurs no cost. There is no evidence of legal enforcement on those who decide to quit. On one hand, this flexibility helps to attract numbers of farmers to the program in the beginning. However, the unstable number of group members makes advanced planning on both production and marketing strategies complicated and difficult to control. For example, plots may be more fragmented and spatially dispersed resulting in inefficient use of inputs such as machines and water. The remaining members may not be able to increase their production to meet the amount agreed to deliver to buyers, which consequently reduces the credibility of the group.

Enticing benefits in short run

In the beginning, together with a considerable amount of budgetary spending, a large number of government personnel and staff were dispatched to recruit farmers to the program. Although many farmers were unaware of the program objectives and benefits, they chose to participate anyway because of the enticing benefits offered in the beginning in terms of input subsidies such as seeds, organic fertilizers, access to loans with a preferential rate, and multiple trainings. In some areas, it was reported that farmers were even offered a guaranteed price higher than market price if selling through the group participating in the program. However, evidence from other areas has indicated the disagreement and failure to establish the guaranteed price which drove some farmers away from the program. To some farmers, the opportunity cost of time spent on multiple training sessions and the failure to establish a guaranteed price have offset the gain from the distribution of subsidized physical inputs.

Farm debt

In many parts of the country, chronic cycle of debt creation and debt repayment discourages farmers from participating in the program or even preventing it in some cases. Due to cash constraint and lack of access to formal credits, many farmers inevitably have to borrow from local input dealers or millers to whom they later have to repay the loans either in terms of cash or payment-in-kind. In many cases, the farmers cannot pay off debts and hence are obliged to continue their input purchase/product sales with their respective lenders in subsequent years. The presence of this barrier means that joining the program and hence receiving the benefits is not a viable option for these farmers in the first place.

Equity issues

Because the program's qualification and loan approval are largely determined based on resource endowment such as land title, minimum size of aggregate plots, and availability of irrigation system, the problems resulted from policy bias that favors large-commercialized farms while discriminating against small-scale farms can arise. Optimistically, if carried out successfully, the program may be able to enlarge farm size by which economy of scale can be utilized. If failed, however, not only that the program is unlikely to reduce poverty and inequality of the poorest farmers, it may even exacerbate these problems. Alternatively, the government may consider improving the channels through which farmers are linked to land rental or land sale markets. This will facilitate land transaction and could in effect increase farm size and farm profits as shown in several empirical studies (Duangbootsee, 2018; Chamberlin and Ricker-Gilbert, 2016; Jin and Jayne, 2013; Deininger and Jin, 2008).

CONCLUSION AND POLCIY IMPLICATION

Despite good intention and high expectation, the prospect of Thailand's large-scale farming model remains unpromising mainly due to the lack of sound economic fundamentals that justifies its initiation in the first place. It is clear that the government has launched the program hoping to improve production efficiency and competitiveness of farmers through economies of

scale and better farm management. The proponents of this programs view small farms as source of inefficiency and need to be incentivized to redirect their resources to mass production and marketing through joint planning. However, the notion of large farms being more productive or more efficient than small farms has remained controversial while its supporting evidence is weak. In contrast, several findings in developing countries and Africa have confirmed the existence of the inverse farm-size productivity relationship, implying the superiority of small large farms relative to large farms in the setting where factor markets are not competitive or imperfect.

In addition, some studies have shown that agricultural production is not characterized by significant economies of scale (or even subject to diseconomies of scale) with the exception of plantation crops and perishable products. The fact that rice farmers account for 61% of total areas registered and 66% of total program participants reflects the inefficiency of rice sector and perhaps the policy bias that has historically favored it. Unlike sugarcane and palm oil plantation, rice farming does not have the production structure that allows scale advantage to take place. As a result, it is unlikely that the program will sustain in the long run after the government's subsidy is withdrawn. Apparently, while advocating and promoting the program, the government has failed to address the underlying causes of inefficiency in agricultural production to the extent that enlarging farm size through the large-scale farming model is not a well-justified approach.

After a short launch, the program has started to see some problems that can severely undermine its future prospect. The biggest concern is finding a well-rounded manager to run the operation when land and other resources are privately owned. The absence of reward schemes also discourages potential farmers from taking such role. In short run, the program may see a decline in participation rate given its weak governance and the short-run enticing benefits in terms of government's subsidy. The degree of land fragmentation will increase as farmers start to exit from the program, reducing the gains from economies of scale if exists at all. Policymakers should also be cautious about the impact that the program could have on rural inequality. Specifically, the program may widen the inequality gap in rural areas because of its nature that tends to favor large farms while discriminating against small farms.

There are some alternative approaches that can be used to replace or to assist the large-scale farming model in order to expedite the process of land enlargement. For example, the government can use a set of policies to stimulate growth of non-agricultural employment in the sectors that are able to productively absorb farm labor. If labor migration between the sectors is effectively facilitated, more agricultural labor will migrate out of agricultural sectors making more land become available and hence an opportunity to increase farm size. Of course, this requires a well-functioning land sale and land rental markets. The revisions of certain legal frameworks relevant to land use and land security will help reducing transaction costs while promoting more land transactions.

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