

Productivity Analysis of Select SMEs in Bangladesh

Sub-sector:
Agro-tools

Prepared for:
KATALYST

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I. Introduction

In Bangladesh, the agriculture sector accounts for almost one fourth of the GDP and more importantly, employs more than half of the total labor force. The agro-tools sub-sector plays an important role in the country's agricultural sector and has traditionally been characterized by its pre-Newtonian technology (simple metallic and wooden agro-tools) produced by rural blacksmiths and carpenters. The introduction of the Green Revolution in the 1960s necessitated the use of advanced agro-tools such as pumps, mixture machines, and trolleys, and many business enterprises (mostly SMEs) entered the agro-tools sector.

In the 1960s, 70s and 80s, the infant agro-tools industry was supported by the government, under import substitution policies that gave these industries the cushion of tariff barriers. However, with economic reform in the 1990s, the barriers to trade were lowered and the domestic industries faced competition in the local market from foreign producers. The local agro-tools producers remained competitive by using the advantage of cheap labor and focusing on low technology, cheaper products.

The sales volume in this industry is limited by the purchasing power of farmers, which fluctuates seasonally with the harvest. That the purchasing power of the farmers has decreased in real terms adds to the challenge. Increased competition at home and abroad and inadequacy of funds add to the list of problems for agro-tools producers. A sharp rise in the price of iron in 2003 has exacerbated their problems further.

This Productivity Mapping study attempts to assess SMEs in terms of productivity and establish a productivity baseline for the agro-tools sub-sector. This report presents a case study of the agro-tools sub-sector to compare the productivity of baseline and benchmark firms and attempts to explain the factors that affect the difference in productivity.

II. The Baseline and Benchmark Firms and their Performances

Based on the findings from earlier Katlyst studies on the variation in performance across locations, the present study presumes that benchmark firms (best performers) are located in Dhaka around Dholaikhal, Nawabpur, and Tipu Sultan Road. On the other hand, agro-tools producers located in Bogra are presumed to be baseline firms (average performers). The survey team conducted an intensive survey of four baseline firms and four benchmark firms. Although within each location firms have been chosen partly randomly, a notion of purposive sample was also there.

Productivity performance was compared in terms of both factor productivity and efficiency analysis. While Data Envelop Analysis (DEA) a non-parametric method, is used to examine technical efficiency, scale efficiency and pure technical efficiency, the Cobb-Douglas production function is assumed to estimate total factor productivity. In addition to total factor productivity, capital productivity and labor productivity has also been estimated. (Methods of productivity estimation and construction variables are detailed in the methodology paper.)

Table 1: Productivity Analysis of the Baseline and Benchmark Firms

	Technical efficiency	Pure Technical Efficiency	Scale Efficiency	TFP	Labor Productivity	Capital Productivity	Capital-Labor Ratio
Baseline							
Firm1	89.5	100.0	89.5	62.6	74.4	66.9	74.4
Firm2	100.0	100.0	100.0	54.3	100.0	71.1	94.2
Firm3	78.6	92.6	84.9	56.7	47.2	66.6	47.4
Firm4	58.0	100.0	58.0	62.5	42.9	45.0	63.8
Average	81.5	98.1	83.1	59.0	66.1	62.4	70.0
STD	15.6	3.2	15.5	3.6	23.0	10.2	17.0
CV	19.1	3.3	18.7	6.1	34.8	16.3	24.2
Benchmark							
Firm1	100.0	100.0	100.0	78.1	24.1	75.9	21.3
Firm2	64.3	95.8	67.1	100.0	24.3	75.8	21.5
Firm3	84.3	100.0	84.3	44.8	22.4	100.0	15.0
Firm4	77.3	88.9	87.0	62.2	19.4	91.7	14.2
Average	81.5	96.2	84.6	71.3	22.6	85.8	18.0
STD	12.9	4.5	11.7	20.3	2.0	10.4	3.4
CV	15.8	4.7	13.9	28.5	8.7	12.1	19.0

Productivity analysis of data reveals similar trends for baseline and benchmark firms, even though the survey team observed that overall performance of the benchmark firms is slightly better than those of baseline firms. According to DEA analysis, there is little difference between the group of baseline and benchmark firms in terms of efficiency. Although one of the baseline firms has the lowest technical efficiency, average technical efficiency score is same for the group of baseline and benchmark firms. In terms of pure technical efficiency, three out of four baseline firms have a score of hundred, while only two out of four benchmark firms have a perfect score. Based on DEA, the baseline firms do not lag far behind benchmark firms.

The intra-group variation in technical efficiency is caused by the differences related to scale efficiency rather differences in pure technical efficiency. Also, the groups of baseline and benchmark firms do not differ much in terms of scale efficiency even though the scale of operation is somewhat smaller for most of the benchmark firms. Thus, the study cannot determine any regular trend about economies or diseconomies of scale.

In terms of factor productivity, the results are slightly different. On the whole, total factor productivity (TFP) is somewhat higher for the benchmark firms. However, intra group variation in TFP is also higher for the benchmark firms. Benchmark firms perform much better in terms of capital productivity compared to the baseline ones. Intra-group variation is also quite small for the benchmark firms. In contrast labor productivity is quite low in the benchmark firms compared to that in baseline firms. The result is quite interesting. One of the reasons for revealed higher labor productivity of the baseline firms is that they hire labor only half of the time of the year. So labor is measured more parsimoniously for the baseline firms. The baseline firms also used more capital per unit of labor as indicated by higher capital-labor ratio.

In summary, there is no regular trend in terms of differences in efficiencies in productivity between the groups of baseline and benchmark firms. While benchmark firms outperform the baseline firms only in terms of capital productivity and only slightly in terms of TFP, they lag well behind the baseline firms in terms of labor productivity. In terms of DEA analysis, the baseline and benchmark groups exhibits similar performance.

One of the reasons for better performance of the benchmark is their awareness and application of better machines, technology and process of production. However, very recently their market has been eroded to the baseline producers as the latter produces cheaper (albeit less durable) products. The problems associated with the benchmark firms are low and stagnant demand for product, inadequate financing, high cost of raw material, electricity failure, and seasonal marketing.

III. Productivity Mapping

The above analysis reveals that productivity gap between the baseline and benchmark firms are not statistically significant in the agro-tools sub-sector. This has been reflected in terms of production process and technology applied. The firms that were surveyed basically produce only one product (pumps). The raw materials used for the production are: molded iron, fan, shaft, bearing, bolt and color. Other than color, all the other inputs are metal inputs, mostly iron and aluminum. The baseline and benchmark firms follow almost identical production processes. They both buy either molded iron (baseline firms buy this from Bogra BSCIC, while the benchmark firms buy from the open market in Nawabpur, Dhaka and Shitakundo, Chittagong) or pig iron and have it molded, cut and shaped, then join the bearing and fan to the metal body, and finally finish the pump and color it. The pumps are traded not by weight but by pieces. The price of a piece of pump varies from Tk. 600 to Tk. 450,000 depending on the size, weight and capacity. It was observed that most of the firms produce smaller pumps; most of the baseline and benchmark firms produce pumps within the price range of Tk 600 to Tk. 2,500. There are no systematic differences in the size of pumps sold by baseline and benchmark firms. Thus the input-output pattern is not very different for baseline and benchmark firms.

The capital-labor ratio, as shown above in Table 1, is higher for the baseline firms, which would imply that the baseline firms employ more capital-intensive production process and use more modern technology. Detailed analysis of the data fails to support this assumption. In this study, measure of capital includes working capital along with the current values of fixed asset. Use of working capital was found to be relatively high in the baseline firms, which lead to a higher capital-labor ratio.

As has been already mentioned, labor is more stringently reported in the baseline firms and is hired only during the peak season of demand. Benchmark firms hire labor more or less on a regular basis. An explanation for this practice could be that benchmark firms do not want to lose their workers to their competitors since the Dhaka labor market maybe more competitive. Also, while the baseline firms shut down during the off-peak season, benchmark firms utilize their capacity to produce

other products. Regardless of the explanation, the measured capital-labor ratio appears to be higher in the baseline area. This measured high capital-labor ratio is not reflected in use of technology. Average number of machines used is higher in the baseline firms; however, average purchase cost of machines is higher in the benchmark firms. All the firms use ‘Lathe Machines’ and ‘Drill Machines’. Some firms use shaper machines, welding machine, *shun* machine (see Table A2 for details). Both baseline and benchmark firms mostly use secondhand and old machines. However, Appendix Table A3 shows that the machines are relatively older in the baseline firms. Also, benchmark entrepreneurs are more satisfied about the quality of plant machinery compared to baseline ones.

With a few exceptions, the average education of the entrepreneurs is comparable in the baseline and benchmark areas. However, both the baseline and benchmark firms employ laborers with low-level of education and no formal training. ‘We don’t get skilled labor because the average level of education is very low among these workers and technical education is not being pursued in our educational system’, said one benchmark entrepreneur. ‘We know that the workers are not highly skilled, but we get by with them’—said one baseline entrepreneur. The workers basically receive on-the-job-training.

Infrastructure support is comparatively better for benchmark industries than for baseline industries, but both the benchmark and the baseline firms suffer from inadequate infrastructure support. The baseline firms cannot use gas as a source of energy because Bogra is yet to be covered under the national gas distribution network. The absence of gas supply compels the baseline firms to use electricity as the sole source of energy and increases their energy costs. Except for one benchmark firm, all other firms reported suffering from disruption in electricity supply (load-shedding, power-cuts and low voltage problems) 60 to 80 days a year (see details in Table A5).

Both the baseline and benchmark entrepreneurs considered the recent lack of access to raw materials as a considerable problem in running business. Recent increases in the price of iron has made their trade much more slow and difficult. On one hand, their production cost has increased and, on the other hand, the buyers (mostly rural farmers) feel that the agro-tools producers are unscrupulously exploiting them in order to make a quick profit. This has damaged their credibility as suppliers. However, both baseline and benchmark firms have reported the low quality of raw materials as a minor obstacle. Hardly any of the firm return raw materials because of quality issues (see Tables A8 and A9 for details).

The above analysis reveals very little difference between baseline and benchmark firms in terms of factors that affect productivity. Benchmark firm had some advantage in terms of infrastructure (basically due to gas connections in Dhaka), which should have positive impact on value added as well as productivity. This advantage is offset by the relatively high wages in Dhaka and by the less economic use of labor throughout the year, despite the seasonal nature of demand.

IV. Entrepreneurs' Perception Analysis

On the basis of the responses provided by the entrepreneurs about various production aspects, an indexation has been done where the value of index is between 0 and 1 (0 indicates high dissatisfaction and 1 indicates high satisfaction). Table A8 shows the degree of satisfaction of the entrepreneurs about different production aspects.

Both the baseline and benchmark entrepreneurs were evenly poised between satisfaction and dissatisfaction about the skill of workers employed. They perceived the problem as a common national phenomenon. The entrepreneurs said that the low level of education of the workers and their lack of access to training facility have been the main reasons behind their low skill level. Both baseline and benchmark entrepreneurs expressed their dissatisfaction over quality of products produced and product design. They said that due to the inadequacy of information on updated technology and lack of cooperation from government and technology development institutes, local agro-tool producers had not been able to improve product design and that in turn did not allow them to improve the quality of the products produced.

Marked difference was seen between the baseline and benchmark entrepreneurs in their perceptions about the quality of plant machinery and quality of raw materials purchased. While the benchmark entrepreneurs said that they were highly satisfied with the quality of plant machinery, baseline entrepreneurs remained indifferent between satisfaction and dissatisfaction on these aspects. Both the baseline and benchmark entrepreneurs said they were happy about the availability of information on sources of raw material.

On the basis of the responses given by the entrepreneurs about various obstacles to trade and production, an indexation has been done where the value of index is between 0 and 1 (0 indicates no obstacle and 1 indicates major obstacle). Table A7 shows the degree of severity of obstacles for the entrepreneurs. Though the number of days in which there was a disruption in electricity were almost the same for both baseline and benchmark firms, the baseline entrepreneurs considered electricity supply as a minor to moderate obstacle whereas the benchmark entrepreneurs considered it as a major obstacle. Considering the fact that baseline firms are more dependent on electricity for production than the benchmark firms, this response is notable. However, neither baseline nor benchmark entrepreneurs complained about water supply, because most of their water needs are met by the tube well they have installed in their firms. Both the baseline and benchmark entrepreneurs considered waste disposal as a minor obstacle, but benchmark firms suffer more from this problem than the baseline firms, mostly because the problem of waste disposal is more regulated in Dhaka than in Bogra.

The benchmark firms in Dhaka consider gas supply as no obstacle, but the baseline firms in Bogra consider it as a moderate obstacle. Neither the baseline nor the benchmark firms consider telecommunication as a problem, they said that private cellular phone companies have resolved that problem for all the entrepreneurs. The condition of roads was considered as a minor obstacle by both baseline and benchmark entrepreneurs, but the benchmark firms consider it as a greater obstacle than the baseline ones do, because the benchmark firms suffer from the poor road

conditions in Nawabpur and Dholaikhal. Both the baseline and benchmark entrepreneurs said that they consider the lack of access to information on product development and production technology as a minor obstacle. They said that lack of concern of government and the policy makers and lack of effective technology development institute hampers the development of local technology and product designs and is one of the main reasons of the lack of efficiency of the local firms.

Benchmark firms do not consider the lack of access to market information (price etc.) as an obstacle. However, the baseline entrepreneurs feel that Dhaka is the central market of agro-tools and since they are away from Dhaka, information reaches them late. Both baseline and benchmark entrepreneurs equivocally said that the lack of skilled labor and lack of training facilities for workers are moderate obstacles for their trade. Most of the respondents said that the government should arrange free training programs for workers of the local enterprises. Most of the respondents have said that competition from import and other local producers has become much greater in the late 90s and it has been increasing.

Lack of access to finance or credit has been considered as moderate obstacle by the baseline entrepreneurs and moderate to major obstacle by the benchmark entrepreneurs. Only one benchmark and one baseline entrepreneurs had taken a loan from a commercial bank and all the respondents said that the poor policy support and bureaucracy have made it impossible for the agro-tools producers to take loans (especially loans for working capital) from commercial banks. The entrepreneurs demanded that the agro-tools producers should be given loans on soft conditions. They suggested that the government should formulate separate credit policies for the agro-tools producers depending on seasonal marketing. Both baseline and benchmark entrepreneurs consider unlawful payment to government officials as a moderate obstacle. All the respondents equivocally said that strikes do not effect their production much but they are affected badly by the stagnation in marketing since buyers do not come during the strikes. It was also reported that pumps produced in the baseline areas are smuggled to India. They demanded that government should take steps to formalize and increase the volume of this trade.

V. Concluding Observations

The study could not identify any systematic gaps in the productivity of the baseline and benchmark firms. The baseline and benchmark firms use similar technology and similar production processes. The advantage of benchmark firms in terms of gas connections is offset by the higher wages and relatively uneconomic use of labor. Optimum production is obstructed by:

- Stagnant markets (reduced sales volume)
- High cost of raw materials (increased cost of production)
- Seasonal marketing (poor use of capacity and reduced productivity)
- High interest rates and inadequate working capital (access to credit difficulty)
- Policy failure (fails to provide special facilities for agro-tools sector)
- Competition in the local market (too many producers for the small and mostly seasonal market).

Appendix

Table A1: Number of machine used in the Baseline and Benchmark Firms

Baseline			Benchmark		
	Total Number of Machineries	Purchase cost (Taka):		Total Number of Machineries	Purchase cost (Taka)
Firm 1	9	225,000	Firm 1	7	550,000
Firm 2	10	248,000	Firm 2	4	370,000
Firm 3	11	282,000	Firm 3	4	310,000
Firm 4	8	358,000	Firm 4	5	360,000
Average	8.5	278,250	Average	5	397,500

Table A2: Types of Machines Used by the Firms

Machines	Baseline				Benchmark			
	Firm 1	Firm 2	Firm 3	Firm 4	Firm 1	Firm 2	Firm 3	Firm 4
Lathe Machine	*	*	*	*	*	*	*	*
Drill Machine	*	*	*	*	*	*	*	*
Shun Machine	*		*					
Shaper Machine				*	*	*	*	*
Welding Machine		*		*				

Table A3: Age and Expected Durability of Machines

Age of Machines		Baseline				Benchmark			
		Firm 1	Firm 2	Firm 3	Firm 4	Firm 1	Firm 2	Firm 3	Firm 4
<5 years old machineries	Percentage	0	0	0	0	100	0	0	0
	Reaming expected life (years)	NA	NA	NA	NA	15	NA	NA	NA
5-10 years old machineries	Percentage	100	100	25	60	0	100	100	100
	Reaming expected life (years)	10	18	10	15	NA	15	12	10
10-20 years old machineries	Percentage	0	0	75	40	0	0	0	0
	Reaming expected life (years)	NA	NA	15	15	NA	NA	NA	NA

Table A4: Output Produced by Firms in 2003

	Baseline				Benchmark			
Product: Pump	Firm 1	Firm 2	Firm 3	Firm 4	Firm 1	Firm 2	Firm 3	Firm 4
Unit	Piece	Piece	Piece	Piece	Piece	Piece	Piece	Piece
Price (taka)	1200	1250	1400	20000	800	2200	2000	450000
Quantity	4000	3500	3000	500	600	150	200	30
Total Sales (taka)	4800000	4375000	4200000	10000000	480000	330000	400000	13500000

Table A5: Disruption of production Due to Problem in Utility Supply in 2003 (days)

	Baseline				Benchmark			
Supply Disruption (days)	Firm 1	Firm 2	Firm 3	Firm 4	Firm 1	Firm 2	Firm 3	Firm 4
Electricity	60	70	80	60	80	45	70	60
Water	0	0	0	0	0	0	0	0
Gas	0	0	0	0	0	0	0	0

Table A6: Percentage of Inputs Received with Lower than Expected Quality

Percentage	Baseline				Benchmark			
Lower Quality Inputs	Firm 1	Firm 2	Firm 3	Firm 4	Firm 1	Firm 2	Firm 3	Firm 4
Input 1	2	2	5	25	5	2	5	5
Input 2	0	0	0	20	0	2	0	0
Input 3	0	0	0	25	0	0	1	0

Table A7: Percentage of Input Returned

Percentage	Baseline				Benchmark			
Return of Input Deliveries	Firm 1	Firm 2	Firm 3	Firm 4	Firm 1	Firm 2	Firm 3	Firm 4
Input 1	2	2	5	15	5	0	5	5
Input 2	0	0	0	10	0	0	0	0
Input 3	0	0	0	15	0	0	1	0

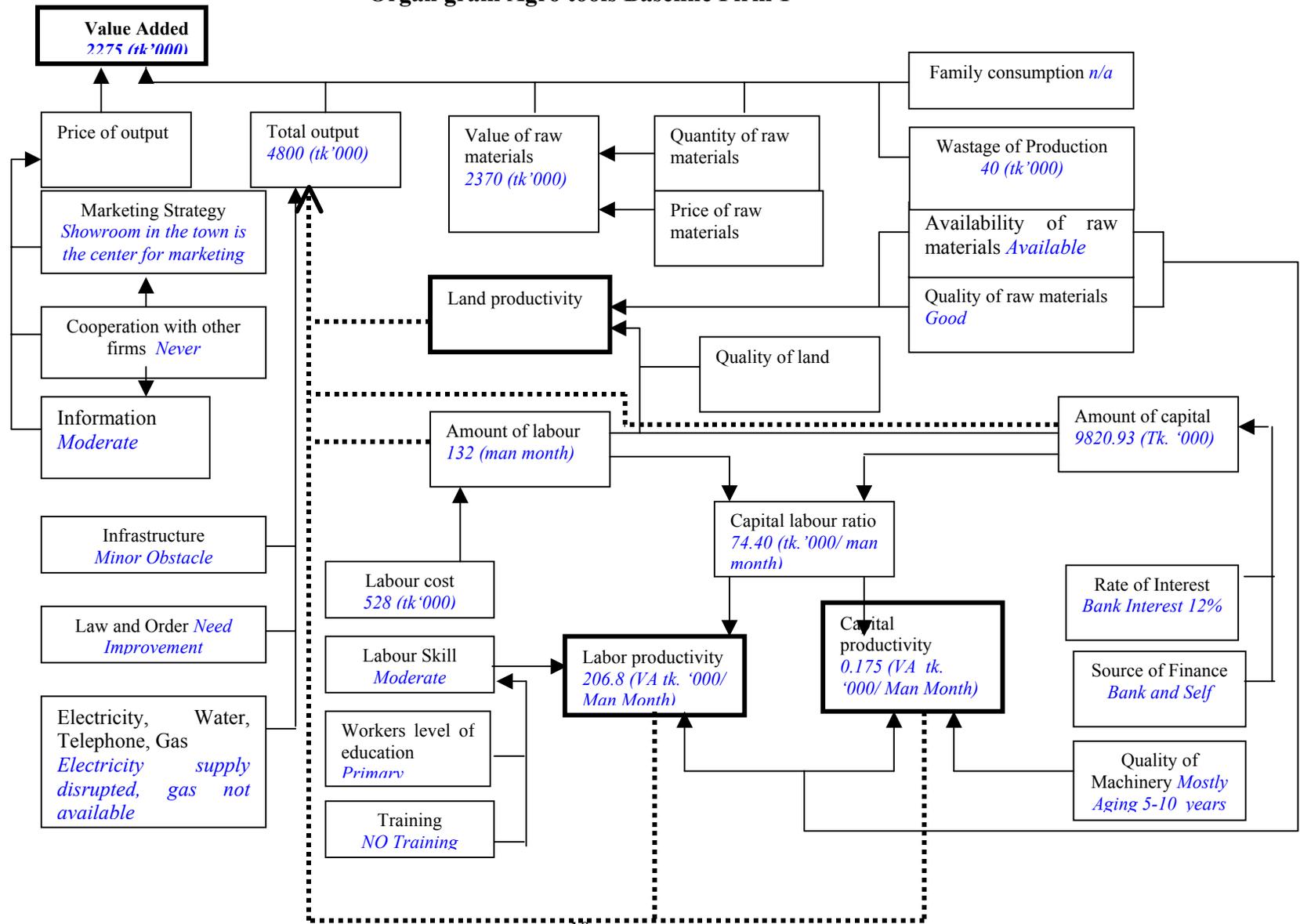
Table A8: Perception about Production Aspects*Index: Between 0 (high dissatisfaction) and 1 (high satisfaction)*

Perception	Baseline Index	Benchmark Index
Skill of workers employed	0.50	0.50
Quality of products produced	0.38	0.30
Product design	0.38	0.38
Quality of plant machinery	0.50	1.00
Quality of raw materials purchased	0.50	1.00
Available information on sources of raw materials	0.75	1.00

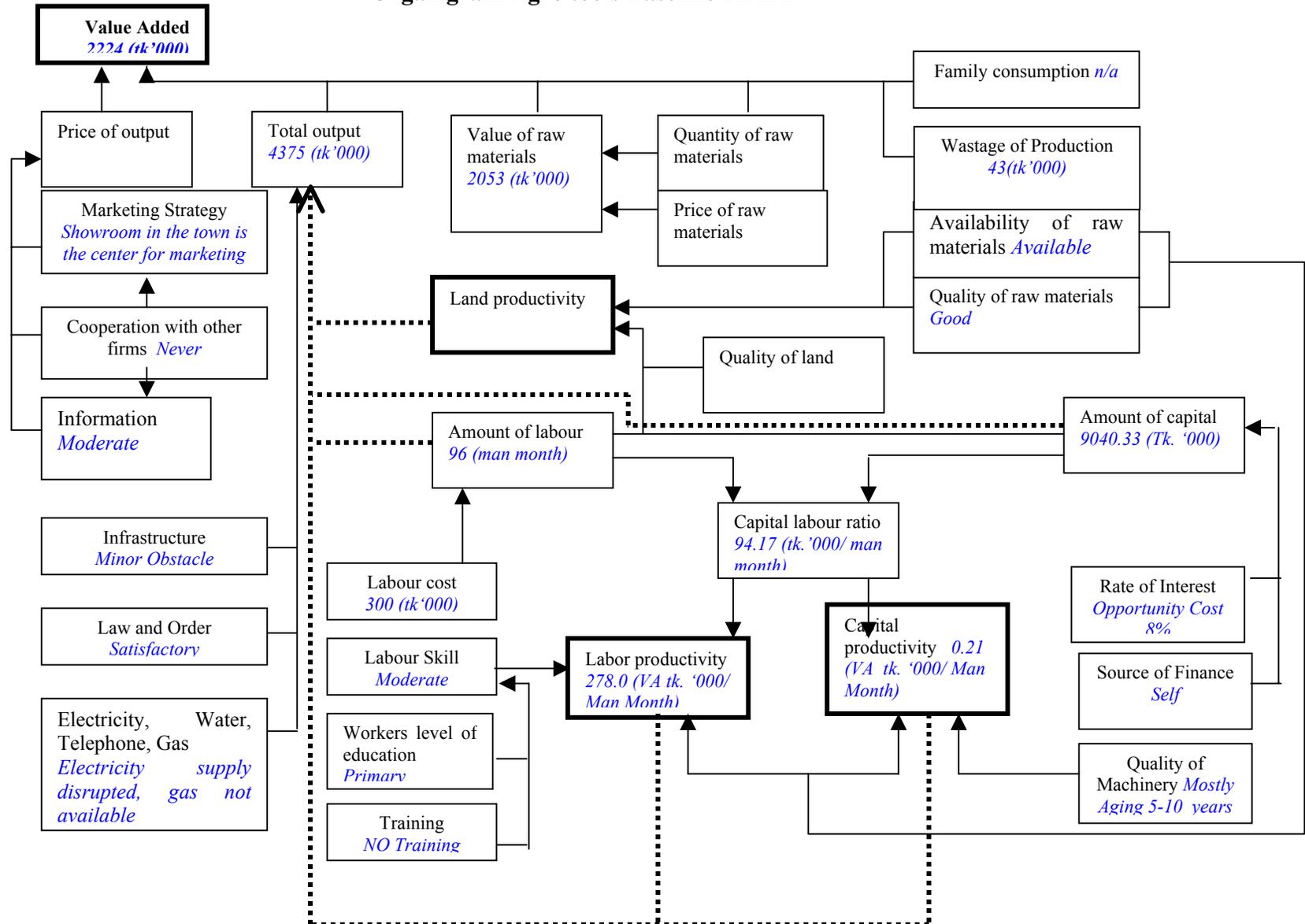
Table A9: Perception about Problems Hampering Production and Trade*Index: Between 0 (no obstacle) and 1 (major obstacle)*

Perception	Baseline Index	Benchmark Index
Electricity	0.44	0.90
Water	0.00	0.00
Sewer, garbage disposal	0.19	0.30
Natural gas/ fuel availability	0.50	0.00
Telecommunications	0.00	0.00
Flood and natural disasters	0.00	0.00
Roads condition	0.13	0.35
Lack of access to information on product development	0.25	0.30
Lack of access to information on improved production technology	0.25	0.20
Lack of access to other market information (such as price)	0.13	0.00
Transportation	0.13	0.20
Lack of skilled labor	0.44	0.40
Lack of training facilities for workers	0.50	0.40
Competition from imported products	0.50	0.65
Lack of access to finance on easy conditions	0.44	0.70
Lack of access to raw materials	0.60	0.60
Poor quality of raw materials	0.13	0.35
Crime, theft and disorder	0.25	0.50
Illegal toll collection	0.25	0.50
Unlawful payments to different government agencies	0.31	0.40
Tax administration	0.25	0.50
Customs and trade regulations	0.13	0.45
Poor quality of products	0.25	0.30
Strikes and hartal	0.25	0.45

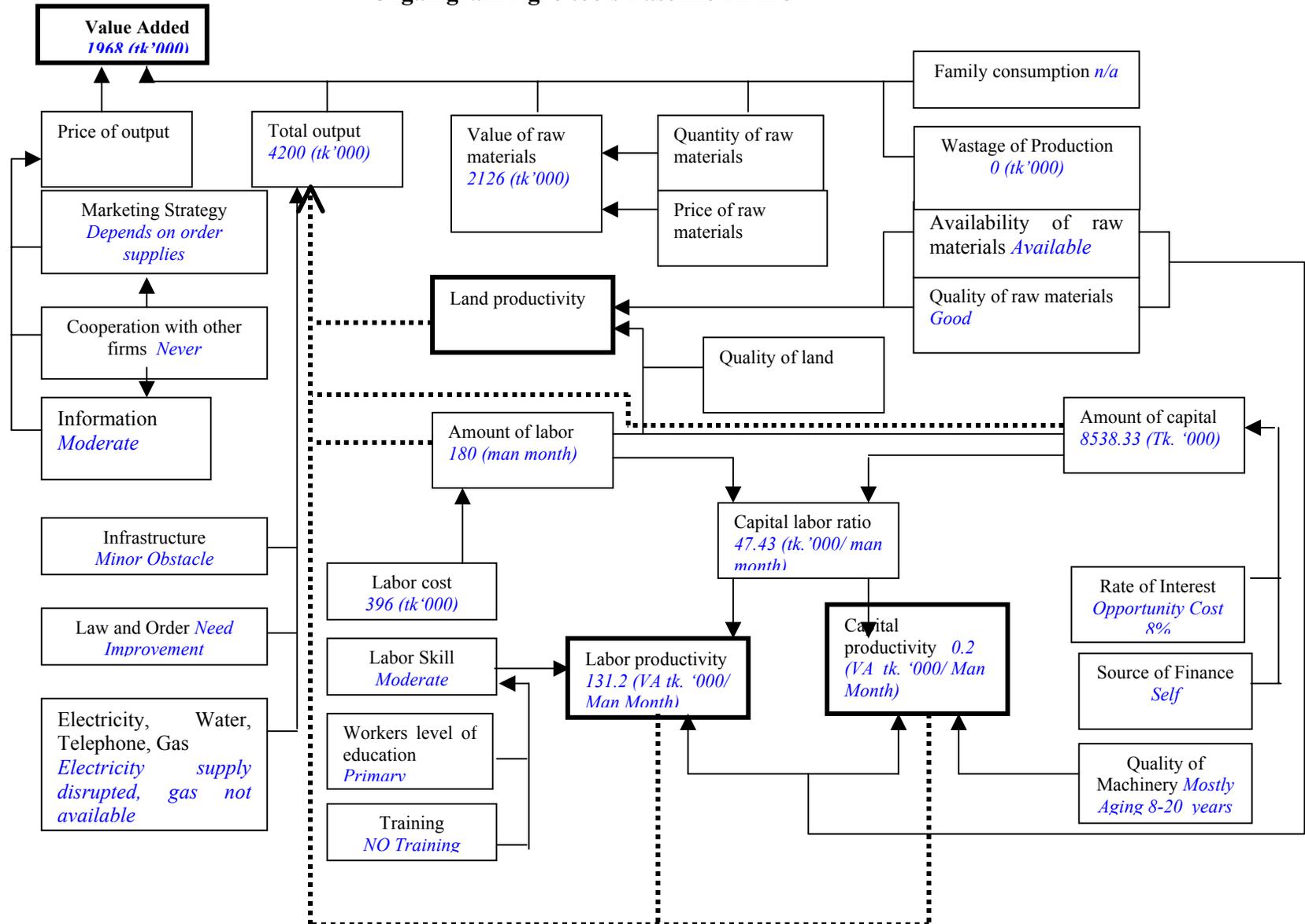
Organ gram Agro tools Baseline Firm 1



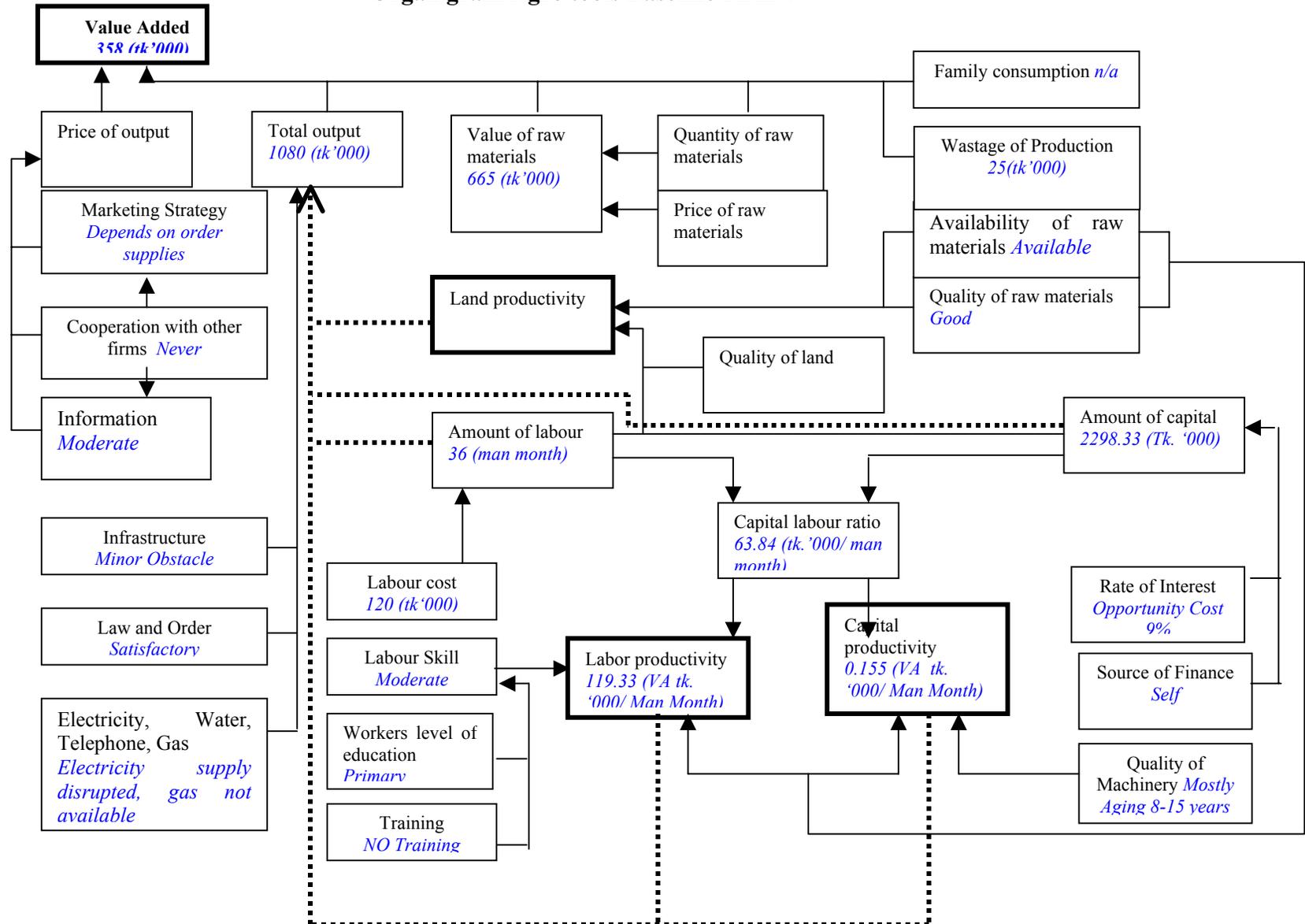
Organ gram Agro tools Baseline Firm 2



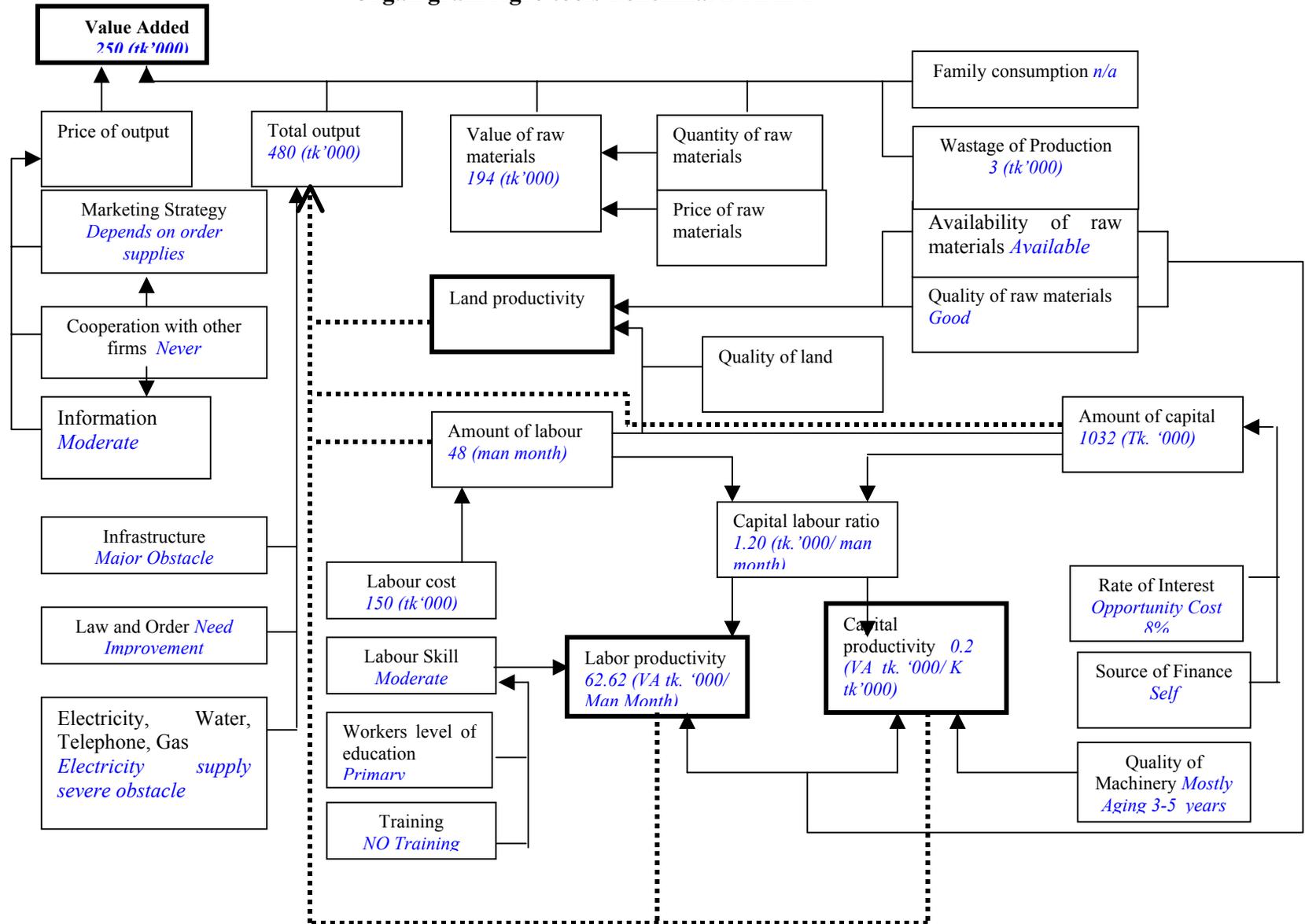
Organ gram Agro tools Baseline Firm 3



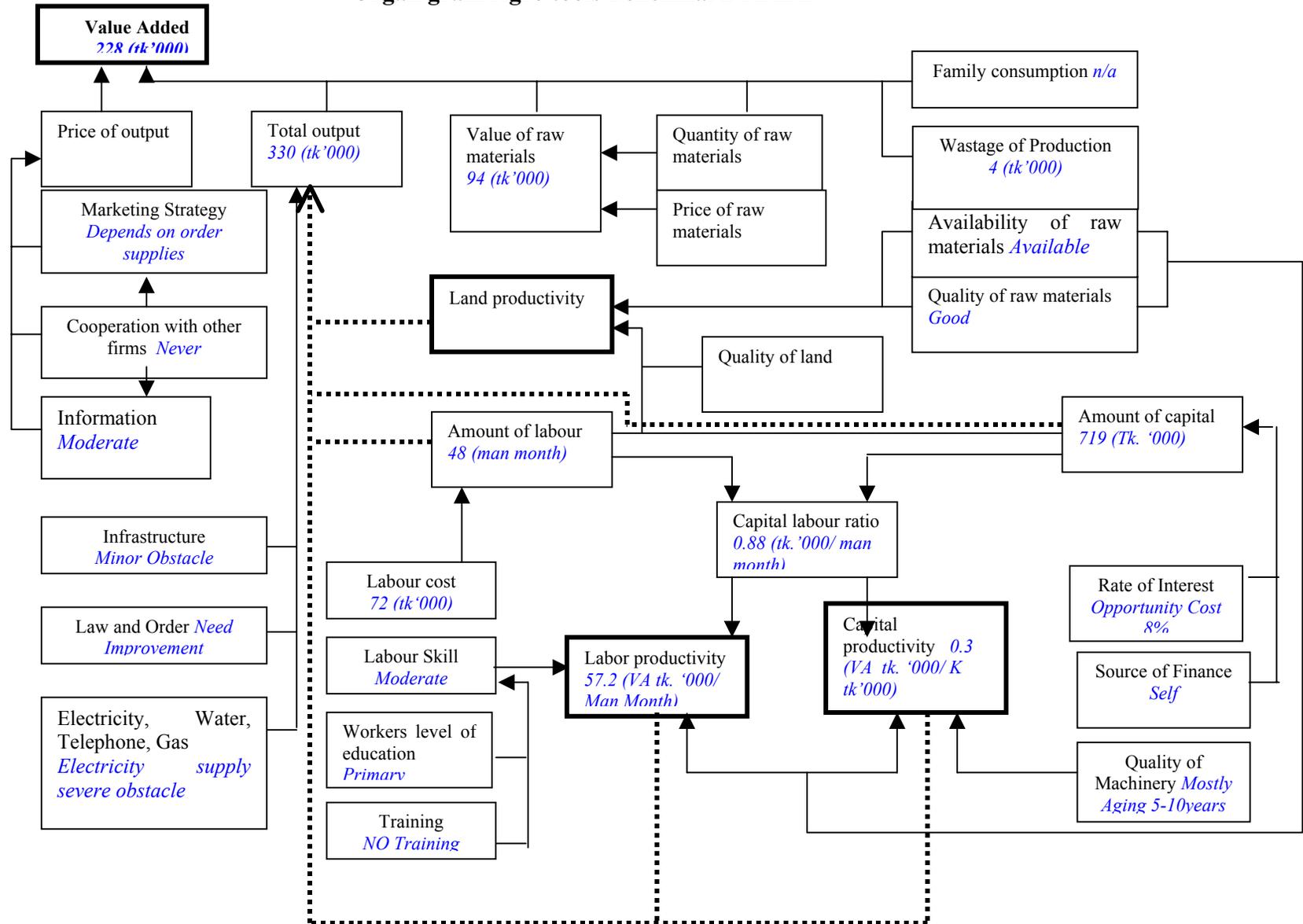
Organ gram Agro tools Baseline Firm 4



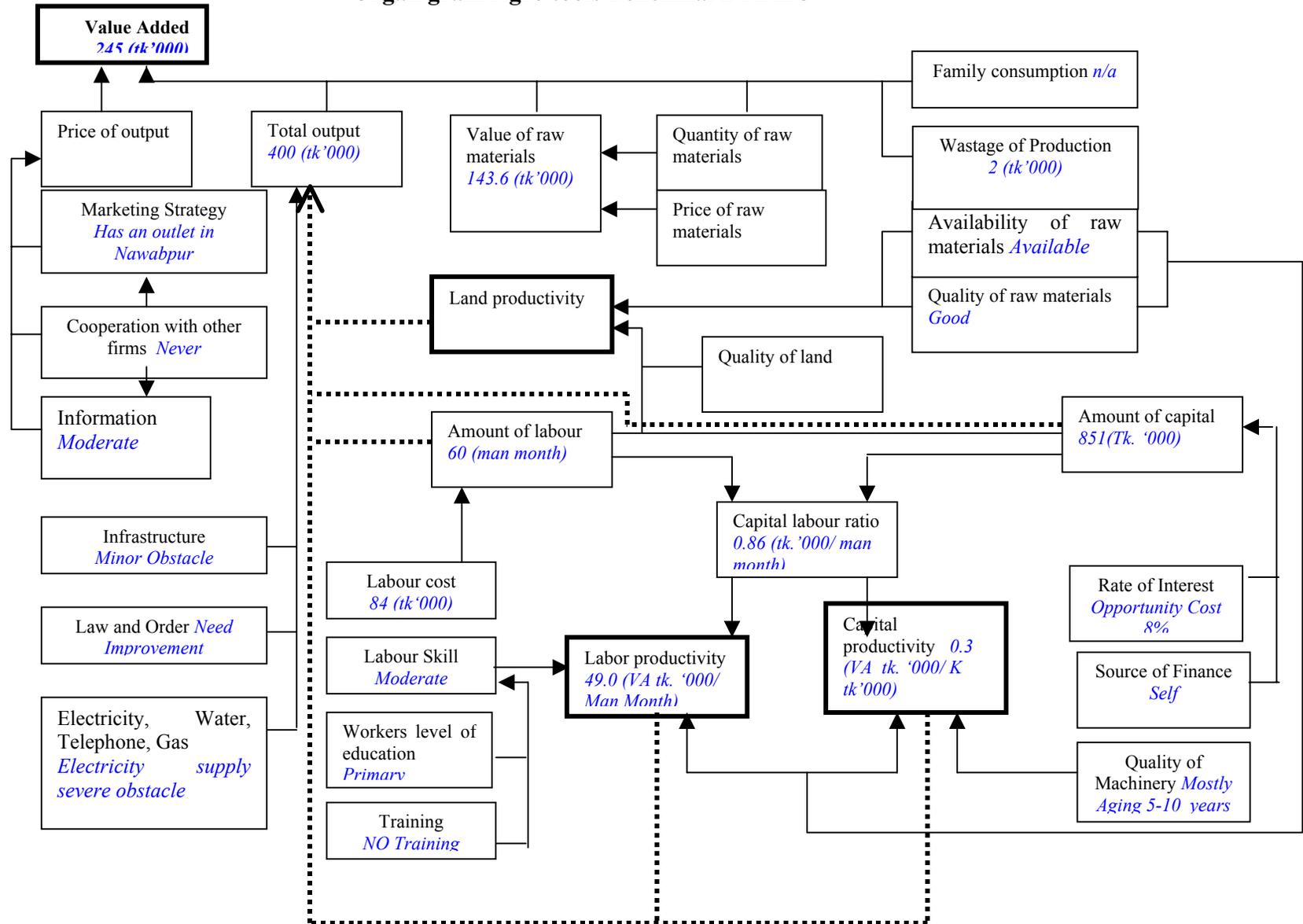
Organ gram Agro tools Benchmark Firm 1



Organ gram Agro tools Benchmark Firm 2



Organ gram Agro tools Benchmark Firm 3



Organ gram Agro tools Benchmark Firm 4

