ISSN 2460-0598

THE ECONOMICAL ANALYSIS OF MECHANIZATION IN LAND PREPARATION FOR THE PLANTATION

M.C. Tri Atmodjo
Researcher of B2TP BPPT
Corresponding author e-mail: atmojo_b2tp@yahoo.com

ABSTRACT - *One of the development of technology in agricultural engineering is the farm mechanization by using farm tractor equipped with disc plow and ridger for land preparation of the plantation. The choose of agrticultural machinery should consider the technical and economical value and the culture of the farmer themselves. The economical analysis shows that One tractor 70 HP and the new price about 800 million rupiah should cultivate 1007 hectars of land for a year which 5 years operation until obsolete. The true analysis of technical and economical in the application of farm machinery would increase the total revenue and benefit of plantation.*

keywords: Tractor, plantation, agricultural machinery, Survey method

1. INTRODUCTION

Machinery and equipment are major cost items in farm businesses. Larger machines, new technology, higher prices for parts and new machinery, and higher energy prices have all caused machinery and power costs to rise in recent years. However, good machinery managers can control machinery and power costs per acre. Making smart decisions about how to acquire machinery, when to trade, and how much capacity to invest in can reduce machinery costs as much as 250.000 rupiahs per acre (0.405 hectare). All of these decisions require accurate estimates of the costs of owning and operating farm machinery. Farm machinery costs can be divided into two categories: annual **ownership** costs, which occur regardless of machine use, and **operating** costs, which vary directly with the amount of machine use. The true value of these costs is not known until the machine is sold or worn out. But the costs can be **estimated** by making a few assumptions about machine life, annual use, and fuel and labor prices. **Ownership** costs (also called **fixed** costs) include depreciation, interest (opportunity cost), taxes, insurance, and housing and maintenance facilities. **Depreciation** is a cost resulting from wear, obsolescence, and age of a machine. The degree of mechanical wear may cause the value of a particular machine to be somewhat above or below the average value for similar machines when it is traded or sold. The introduction of new technology or a major design change may make an older machine suddenly obsolete, causing a sharp decline in its remaining value. But age and accumulated hours of use are usually the most important factors in determining the remaining value of a machine.

The joint costs of depreciation and interest can be calculated by using a **capital recovery factor**. Capital recovery is the number of dollars that would have to be set aside each year to just repay the value lost due to depreciation, and pay interest costs.

Capital recovery = (total depreciation x capital recovery factor) + (salvage value x interest rate)

Taxes, insurance, and housing (TIH) are usually much smaller than depreciation and interest, but they need to be considered. Property taxes on farm machinery have been phased out in Iowa, except for very large inventories. For states that do have property taxes on farm machinery, a cost estimate equal to 1 percent of the purchase price is often used.

Insurance should be carried on farm machinery to allow for replacement in case of a disaster such as a fire or tornado. If insurance is not carried, the risk is assumed by the rest of the farm business. Current rates for farm machinery insurance about 0.5 percent of the purchase price.

There is a tremendous variation in housing provided for farm machinery. Providing shelter, tools, and maintenance equipment for machinery will result in fewer repairs in the field and less deterioration of mechanical parts and appearance from weathering. That should produce greater reliability in the field and a higher trade-in value. An estimated charge of 0.5 percent of the purchase price is suggested for housing costs.

To simplify calculating TIH costs, they can be lumped together as 1 percent of the purchase price where property taxes are not significant.

TIH = 0.01 x purchase price

Total ownership cost (fixed cost)

The estimated costs of depreciation, interest, taxes, insurance and housing are added together to find the total ownership cost. This is almost 10 percent of the original cost of the tractor.

Operating costs (also called **variable** costs) include repairs and maintenance, fuel, lubrication and operator labor.

Repairs and maintenance

Repair costs occur because of routine maintenance, wear and tear, and accidents. Repair costs for a particular type of machine vary widely from one geographic region to another because of soil type, rocks, terrain, climate and other conditions. Within a local area, repair costs vary from farm to farm because of different management policies and operator skill. The best data for estimating repair costs are records of your own past repair expenses. Good records indicate whether a machine has had above or below average repair costs and when major overhauls may be needed. They will also provide information about your

maintenance program and your mechanical ability. Without such data, though, repair costs must be estimated from average experience.

The average repair cost per hour can be calculated by dividing the total accumulated repair cost by the total accumulated hours:

Fuel

Average fuel consumption (in gallons per hour) for farm tractors on a year-round basis without reference to any specific implement can also be estimated with these equations:

*0.060 x maximum PTO horsepower for **gasoline** engines*
*0.044 x maximum PTO horsepower for **diesel** engines*

For 180-horsepower diesel tractor example

Average diesel fuel consumption = 0.044 x 180 horsepower = 7.92 gallons/hour

Average fuel cost per hour = 7.92 gallons/hour x Rp 26.000/gallon =Rp205.900/hour

Lubrication

Surveys indicate that total lubrication costs on most farms average about 15 percent of fuel costs. Therefore, once the fuel cost per hour has been estimated, you can multiply it by 0.15 to estimate total lubrication costs.

Labor

Because different size machines require different quantities of labor to accomplish such tasks as planting or harvesting, it is important to consider labor costs in machinery analysis. Labor cost is also an important consideration in comparing ownership to custom hiring.

Actual hours of labor usually exceed field machine time by 10 to 20 percent, because of travel and the time required to lubricate and service machines. Consequently, labor costs can be estimated by multiplying the labor wage rate times 1.1 or 1.2. Using a labor value of Rp 9.000 per hour for our tractor example:

Labor cost per hour =Rp9.000 x 1.1= Rp 9.900.-

Different wage rates can be used for operations requiring different levels of operator skill.

Total operating cost

Repair, fuel, lubrication and labor costs are added to calculate total operating cost.

Total cost

After all costs have been estimated, the total ownership cost per year can be added to the operating cost per hour to calculate total cost per hour to own and operate the machine. Total cost per hour for our example tractor was:

Implement costs

Costs for implements or attachments that depend on tractor power are estimated in the same way as the example tractor, except that there are no fuel, lubrication or labor costs involved.

2. MATERIALS AND METHOD

Materials used was diesel oil which fuel for the operation of tractor process in the land preparation. Tractor 70

HP as perception object equiped by disk plough and maker of ridge or ridger. Method used was method of

Survey to usage of tractor processing of land preparation for plantation. Data collected was Field capacities, Operation of tractor, Tractor operating expenses, and Economic Analysis.

3. RESULT AND DISCUSSION

3.1. Capacities of Agriculture Machine

Capacities of Machine covering size measure and machine type usually adapted for by wide farm area. The Hand Tractor 10 HP according to for the plots of research with some square meters. Mini tractor 4 wheel 20HP according to for farm which land acreage was some hectares . Big tractor 70 HP according to tens of hectare. Big tractor more than 100 HP according to for farm hundreds of hectare. When farm of cassava more than 100 hectares so tractor size measure is 70 of HP and calculation of its economics require to be analysed to specify priority scale election of tractor. Economic Analysis illustration presented in chapter hereinafter.

Before buying Alsintan require to be decided such brand, size or measure and most efficient type to its machine and also its farm scale . Revenue or cash in from the farm do answering to buy farm tractor or enough rent as limitations.

3.2. Field Capacities

Theoretical Field Capacities is speed of operation yielding certain acreage which operated continuously according to wide of its attachment. Time Loss or repair time and farm on turning disregarded. Tractor 70 HP with attachment 3 diskplow bottom have theoretical field capacities about 2 hour per hectare.

Effective field capacities is average speed able to be gone through by appliance in set of hectare per hour . This matter are including missing time tip of turning in the field end and repair. Mathematically effective field capacities is average speed multiplied by wide of attachment and multiplied by field efficiency.

Field efficiency is effective field capacities divided with theoretical field capacities is then multiplied by 100 Field efficiency of plough about 74 to 84 %, disk harrow between77 to 90 %.

The combination of knowledge of genetic, water and land conservation, chemical and physics accompanied by ability of business get exellence yield of agricultural product. We join modern knowledge with art of old custom together with machines energy. Its result larger ones efficiency in production of cassava for food, industry and also feed base on cassava.

3.3 Ownership

Owning machine or renting of Alsintan is a depended matter according to economic value of alsintan. There are advantage and disadvantage rent alsintan. Advantage rent alsintan for example 1. There is no expense for buying which costly enough 2. Purchasing capital earn allocation at something else 3. Get advantage of information concerning immeasurable machine operation of its technology 4. Repair is owner responsibility. Disadvantage from renting alsintan are 1. Machine operation is not unerring its time 2. The operator doesn't responsible the yield of job, 3. Risk bring disease and pest of other field 4. For larger of work get higher total expense than owning machine alone 5. Owner prefer to larger of work and like to delay smaler of work.

When we will own tractor for the processing of land to plant of cassava hence require to be considered.

Before hand regarding fixed cost and operating expenses or variable cost. As illustration when owning tractor

70 HP complete with its attachments hence costs shall be as follows.

A. Annual Fixed Cost

Estimate cost (Rp / year)

1). Depreciation = (Expense buy - Final value): economic age = (Rp 800.000.000 - Rp 80.000.000 : 10 th = Rp 72.000.000/year

2). Capital interest = Price buy + final price : 2 x D.F = Rp800.000.000 + Rp 80.000.000 : 2 x 20 % = Rp 88.000.000/year

3). Others (garage etc) = 1% of price buy

Rp 800.000.000 x 1% = Rp 8.000.000/year

Fixed cost = Rp 168..000.000 per year

Assumed that tractor activity per year = 300 day /year x 5ha / day= 1500 ha / year

Become Fixed cost per hectare is Rp 168000.000: 1500 hectars = Rp 112.000 per hectare

B. The Expense of Operation(Variabel cost)

1).Fuel cost = 10 litre / hour x Rp 8.000 = Rp 80.000 /hr

2). Lubricant= 10 litre / 200 hour x Rp 100.000 /ltr = Rp5.000 /hr

3).hidraulic oil of gear= 20 lt / 300 hour x Rp 150.000 = Rp10.000/hr

4).Greas = 1 kg / 200 hour x Rp 100.000= Rp500 /hr

5). Repair and maintenance = 40% price buy : 4000 hours= Rp 80.000/hr

6). Operator fee = Rp 10.000/hr

total cost of Opersional /hour (Variabel cost) is Rp185. 500 /hour.

Operating expenses per hectare = Rp 185.500 x 2 hour / ha = Rp 371.000,- / ha

Total cost per hectare = Rp 112000 + Rp 371.000 = Rp 483.000 / ha

The land acreage of minimum of field operation so that happened Break Event Point (BEP) with assumption of

its expense of processing of field is equal to Rp 650.000 / ha

BEP Break Event Point) = Rp168.000.000 : (Rp650.000 - Rp 483.000)

= Rp168.000.000 : Rp 167.000 / ha = 1007 hectars for a year

Benefit cost ratio (B/C ratio) =Rp 650.000 : Rp 483.000 = 1,34

NPV (Net Present Value) : Rp 1.022 Billion by 1500 hectars operation per year for 10 years operation

Pay Back Periode : Rp 800.000.000 : Rp 250.500.000 x 1 year = 3.2 years

The tractor operational is enough when processing of field at least per year is 1007 hectares. When 1 tractor workday for 5 hectares hence needed 202 workday per year. There are 300 workday per year and on certain day process of field less from 5 hectares for example 4 hectares. By the maximum 5 hectars operation a day we can get NPV (Net Pressent Value) Rp1,022 billion for 10 years operation.

Attachment used is disk plow-tractor mounted 3 bottoms namely plough saucer by 3 plowshare joined forces

with tractor so that easy for the evacuation of work location and twiddling of farm back part. Processing of this

field recognized with processing of first field ploughing. For the crop of cassava processing of field hereinafter

conducted about one week later depend upon dry or wet weather. In the form of making of line of plant or "ridge" using mounted ridger-tractor 3 bottoms.

4. CONCLUSION

1. Land preparation by mechanizing in cassava cultivation by usage of agriculture machines accompanied by excelence calculation of its economics will improve its agriculture farm productivity.

2. Usage of new tractor with energy about 70 HP and the price of buying was Rp 800 million got break event point when the minimum acreage of field processing in one year is 1,007 hectars.

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