

# USING THE PPP MODEL TO ANALYZE PERFORMANCE AT A MICRO-IRRIGATION COMPANY

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## ABSTRACT

The importance of water conservation is well-known, and micro-irrigation plays an important role. Managing the performance of organizations in micro-irrigation is also important. This study attempts to make a micro-irrigation company more competitive through an application of the model “Profitability = Productivity + Price Recovery” (PPP). This model is a multi-factor performance measurement model that uses chained-link deflation technique. The results from this application help identify the problem areas so that management can take appropriate action for improvement. This research should be of interest to business executives and researchers in the areas of performance measurement and micro irrigation.

## INTRODUCTION

Globalization has taken the center stage in influencing the way managers run the affairs of their organization. Significant changes are taking place in industries and there are also issues with destruction of the environment due to large scale industrial changes (Aquino et al., 2015). As such, management of business organizations are charged with the responsibility of making the right decisions in order to get things done (Bodole, Koech and Pezzaniti, 2016). Hence, performance measurement is crucial when dealing with issues concerning effective management of the resources available to an organization for successful business (Caleio et al., 2008). Performance measurement is not only a crucial aspect of performance management but is considered the “Backbone” of performance management system (Briassoulis et al., 2011). Performance measurement and organizational excellence are alike in that while organizational excellence has to do with rendering quality services to stakeholders as well as effective management of an organization’s resources, performance measurement is chiefly concerned with information concerning the outcomes and results of an organization (Burt et al., 1997). It is on this note that scholars have researched on more reliable ways of measuring the performance of organizations (Chen et al., 2010; Datta, 1995; Kumar et al., 2015, Kumar et al., 2009; Gamri et al., 2014).

There are studies that have shown that profit and cost which are regarded as traditional performance measures are not efficient enough in managing a dynamic environment (Fentabil et al., 2016). The reason for this is simple. Traditional performance measures cover the “now” and does not take into consideration, the future (Mary Rani, Rao and Rambabu, 2015). An ideal performance measurement is expected to consider every aspect of an organization’s performance in the right combination. Therefore, satisfaction of stakeholders, excellence, quality standards and

participation have become the ideal performance measures (Moraes et al., 2016). Also, performance measurement is expected to align with the characteristics of the organization being assessed (Lu et al., 2015).

The importance of irrigation to many countries can never be overemphasized. Income of rural dwellers, agricultural and food production, revenue as well as provision of funds for the development of rural areas are some of the benefits of this system to many countries particularly developing countries. Despite these benefits, there is growing concern of poor performance of irrigation systems in developing countries (Madhava et al., 2016). In Turkey, for example, 65% and 45% have been noted as values of the irrigation ratio and irrigation efficiency respectively (Boumi and Demir, 2009). Leaky canals, head-tail problems and malfunctioning structures have been spotted as common problems responsible for low water performance and subsequently low yield. However, more of the problems have been attributed to poor management of water in the system (Aquino et al., 2015).

This research study examines the performance management of micro irrigation in various countries and offers solution for successful management. There are many performance measurement models. The models that include productivity measurement go from single factor productivity measures to multi-factor productivity measures (Hannula, 2002; Rao, 2006). Data Envelopment Analysis developed by Charnes, Cooper and Rhodes (1978) focuses on efficiency of business units. Balanced Scorecard (BSC) developed by Kaplan and Norton (1992) is a comprehensive performance measurement system. Implementing BSC is not an easy and quick task. Somewhat easily implementable ones are profit-linked performance measurement models (Miller and Rao, 1989). They use basic accounting data and provide results in dollars instead of ratios or indexes. These models should be very appealing to the business executives. APC is one of the two models. It “was developed by the American Productivity and Quality Center” (Miller and Rao, 1989). The other model is the PPP (Profitability = Productivity + Price Recovery) model (Miller, 1984). Both models link productivity to profitability, and they are used for evaluating the performance of three measures – profitability, productivity and price recovery. There have been applications of these models in various industries (Miller, 1984; Rao, 2006; Rao, 2007; Rao and Phusavat, 2013; Rao, et al, 2018). They are appropriate models to measure performance at the organization level and uncover problem areas at all levels of the organization.

This paper focuses on the metrics resulting from the implementation of the PPP model. A spreadsheet-based application of this model was developed for a micro-irrigation company. The rest of the paper is organized as follows: The application development, Discussion of results, and Conclusion.

## **A CASE STUDY**

For developing a spreadsheet application of the APC model for Finolex, eight quarters of data was collected. The data included quantities, prices and values of both inputs and outputs. The outputs are Extrusion, Molded items, PVC pipes and Other traded items. The inputs are classified into categories such as Material, Energy, Repairs and Maintenance, Employees, Operating Expenses, Sales and distribution. Once the data is setup, a series of calculations are performed to obtain the dollar contributions of resources and resource categories in terms of productivity, profitability and price recovery. Further details of these calculations can be found in Rao (2000). This

implementation is based on the conventional approach where the first period is used as the standard against which the performance of all other periods is measured.

## INTERPRETATION OF RESULTS

Understanding the organizational performance results begins with the overall performance results. Then, we look at the results at the category level and finally at the resource level. The overall performance results and category level results in terms of productivity, price recovery and profitability contributions are shown in Tables 7, 8 and 9. Overall performance results are also shown in Figure 1.

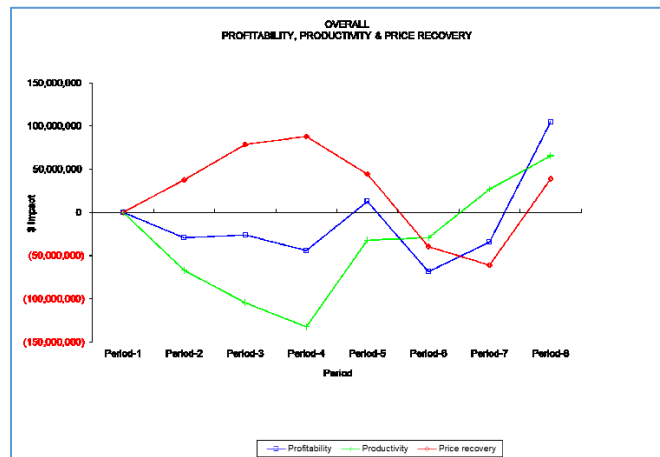


Figure 1. Overall Profitability, Productivity and Price Recovery

Figure 1 results show that there has been an overall productivity problem until period 7. There was a price recovery problem as well in periods 7 and 8. However, the performance has improved in the most recent period in terms of productivity, price recovery and profitability. Things are looking up.

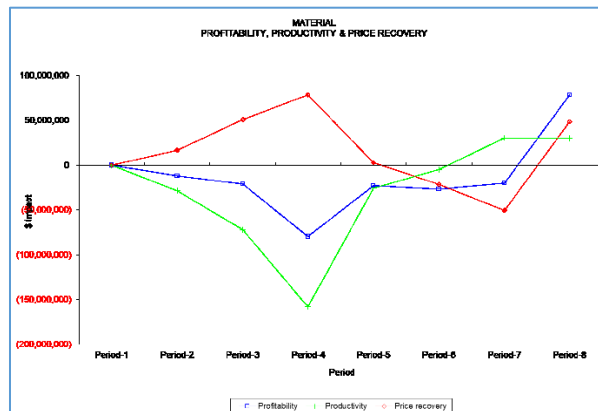


Figure 2. Performance Measures of Materials

The next step after overall performance evaluation is reviewing the performance at the category level, especially the categories that impact the overall performance heavily. Material category seems to be the category that has significant impact on overall performance. Figure 2 shows material performance, which has a similar pattern as the overall chart. Material productivity has been dragging down profitability of the organization.

### **SUMMARY AND CONCLUSION**

PPP model is one of the two profit-linked performance measurement models. PPP used chain-linked deflation technique to calculate constant dollars and productivity contributions. In this paper, we have described a performance measurement application using the PPP model for a micro-irrigation company. The overall results show that there was a productivity problem for several periods until recently. The problem seems to have been due to Material. The company has recently invested in new technology and automation, which led to the improvement in performance.

This paper should be of interest to anyone interested in performance measurement and micro-irrigation. The PPP model could be implemented in any revenue-generating organization. It needs basic accounting data on inputs and outputs. The research could be further extended into variations of base periods, using optimal data as the standard, and comparing the results from other models.

### **REFERENCES**

Available upon request.