I. INTRODUCTION

1.1 Background

Land suitability is the degree of suitability of a parcel of land for specific use. Land suitability can be assessed for the current state (the actual land suitability) or after a repair (potential land suitability). Land suitability classification structure in the framework of FAO (1976) can be distinguished according to its level, namely the level of the Order, Class, Subclass and Unit. The Order is a state of global land suitability. At the level of orders suitability distinguishes between land that is classified as suitable (S) and not suitable (N). The term land suitability used by a lot of land classification system, especially by the Soil Conservation Services, USDA; in the USDA system, the soil mapping units are grouped primarily on the basis of ability or suitability of land for producing agricultural crops and fodder.

The increase in of beef demand by society will lead to an increase in cattle population to meet those needs. The Indonesian government policy to make meat self-sufficiency by 2014 is expected to become reality by taking into several factor such as supporting quality and availability of forage throughout a year.

These problems are challenging the government of East Nusa Tenggara province to return the predicate in year 1970s that is East Nusa Tenggara as a cattle source, with a policy that Kupang District is either one as center of Bali cattle (Bos Sondaicus) producers. To be able to support that programs, District Kupang government must give special attention to the availability of animal feeds, because in order to develop Bali cattle (Bos sondaicus) on a large scale is needed necessary availability of adequate and sustainable feeds throughout the year. The given climatic conditions of the region are relatively dry; it needs a fodder crops which can survive in poor conditions like this. East Nusa Tenggara is in a good position to encourage the growth of the livestock sector, especially since the central government looked at East Nusa Tenggara as one of the two main sources of animal cattle in Indonesia (Christie, 2007).
Leucaena leucocephala is a forage legume, which contains high protein required for animal growth. L. leucocephala has been used as the main fresh forage throughout the year for Bali cattle in Amarasi Sub District with satisfactory results; the legume has a big impact in supporting the productivity of Bali cattle. (Piggin, 2003, Nulik, 2002); Depending on variety, Leucaena is either a tall tree or a branchy bush. It can be used for timber, firewood, fiberboard, paper, forage, fertilizer, landscaping, soil reclamation, shading for sun-sensitive crops, windbreaks and firebreaks as well as for dye, mucilage, jewelry and even human food. Moreover, Leucaena adapted to many soils too barren for conventional crops and it is one of the fastest growing plants measured. It obtains its own nitrogen fertilizer from air, survives drought, tolerates the salt of coastal areas and has a high resistance to pests and diseases (Benge, 1980; Vietmeyer, 1980)

A recent experiment has shown that improved breeds of cattle will gain as much as 1 kg in weight per day when fed a 100% ration of protein-rich Leucaena for a 3 month-period prior to slaughter. These tests were conducted by the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Australia. The leaves of improved strains of Leucaena contain 23%-30% protein by dry weight. Cattle can consume a high intake of Leucaena for a period of four months without any adverse effects, a length of time ideal for the fattening of cattle prior to slaughter (Vietmeyer, 1980)

A Geographic Information System (GIS) is a system for capturing, storing, analyzing and managing data and associated attributes which are spatially referenced to the earth. GIS refers to computer software that provides data storage, retrieval, and transformation of spatial (field) data. GIS software for digital agriculture will store data, such as soil type, nutrient levels, etc, in layers and assign that information to the particular field location. A fully functional GIS can be used to analyze characteristics between layers to develop application maps or other management options (Jessica, 2009). Information technology, especially Geographic Information System can be used to determine land suitability for growth of L. leucocephala and predict the carrying capacity to support feed security. This technology is applied to selecting area
by considering many factors such as rainfall, temperature, soil type, topography and other socio economic factors.

Cellular Automata (CA) is usually associated with synchronous deterministic dynamics, and their asynchronous or stochastic versions have been far less studied although significant for modeling purposes. CA has attracted growing attention in growth simulation because their capability in spatial modeling is not fully developed in GIS. CA can be extended and integrated with GIS to help planners to search for potential suitability of *L. leucocephala* for sustainable development. The cellular automata model is built within a grid-GIS system to facilitate easy access to GIS databases for constructing the constraints. The essence of the model is that constraint space is used to regulate cellular space. Driving force and constraints play important roles in affecting modeling results. Combination of GIS and CA can be used as a strong couple to model the *L. leucocephala* growth to take advantages of both the technique. In case of GIS, its spatial data analysis capacities may be insufficient to handle the complex of *L. leucocephala* growth dynamic.

### 1.2 Scope of Study

The area of study is restricted to district level. This study is focused to find land suitability for growth of *L. leucocephala* in Kupang District, East Nusa Tenggara Province. It covers suitable area for *L. leucocephala* growth by considering several factors such as climate factor, physical factor, social and culture or attractiveness factor, and than predict the feed security for livestock’s farming.

### 1.3 Problem Statement

Beef cattle’s farming requires the continuous availability of feeds, in other side *L. leucocephala* is one of the forage that has many advantages can be reliable for the less fertile areas such as Kupang District. The Amarasi Farming System has been proven to support the existence of Bali cattle feedlot business based on *L. leucocephala*. Kupang District has a fairly broad region expected to be developed as potential fodder like a *L. leucocephala* to support the Bali Cattle industry, which is
area is suitable to be developed a *L. leucocephala*; it will be answered with consider various criteria such as climatic factors, soil factors, topography factors, driving force factors and constraints.

1.4 Research Objectives

The objectives of the study are to determining 1). Land suitability for growth of *L. leucocephala* and 2). Develop a model that can represent spatial distribution pattern of *L. leucocephala* and then 3). Predict the carrying capacity to support feed security for Bali cattle industry in Kupang District with used integrated of GIS and Cellular Automata (CA) modeling to develop the growth simulation model.