

# Intercropping System for Growth and Yield in Local Varieties of Madura

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## ABSTRACT

This study aims to determine the growth and yield of Madura corn and Peanut with the intercropping system Sari. This study uses an experimental method (true experiment), defined as the method used to look for the effect of certain treatments on others under controlled conditions. In this case the writer uses the control class as a comparison so this study can also be called a pure experiment. The results showed that the best on Growth Results and Yield with intercropping system was local corn while the peanuts were not so good. Because at the time of harvest corn is harvested earlier than peanuts.

**Keywords:** Overlapping, Corn and Peanuts

## 1. INTRODUCTION

Madura is one of the peanut producing regions in East Java which is the largest producer in Indonesia (Anonymous, 1994). In this area peanuts are widely planted in dry land using both intercropping systems with corn and monocultures. And in Indonesia, the average production of peanuts is still relatively low, ranging from 0.7 - 1.5 tons / ha of dry pods (Sumarno, 1987). The low yield of peanuts at the farmer level is due to the use of inferior varieties, the unavailability of quality seeds, simple farming methods, unsuitable environmental conditions and pest attacks (Anonymous, 1994).

Plant spacing with a certain density aims to provide space for each plant to grow well. Plant spacing will affect the density and efficiency of light usage, competition between plants in the use of water and nutrients so that it will affect crop production (Ali, Hosir, & Nurlina, 2017). At low densities, plants compete less with other plants, so the individual appearance of plants is better. Conversely at high density, the level of competition between plants against light, water and nutrients is getting tighter so that plants can be stunted growth (Setyati, 1979 in Supriadi, 1986). And the effect of spacing between rows on intercropping systems of several varieties of sweet corn with red beans on growth and yield (Marliah, Jumini, & Jamilah, 2010).

Intercropping (*intercropping*) is a polyculture planting pattern that is often used in crop cultivation, including local corn plants. According to Jumin (2002), intercropping is intended to make the best use of the environment (nutrients, water and sunlight) in order to obtain maximum production.

Thahir & Hadmadi (1985) in Abidin (1991) states that intercropping aims to get yields more than once from one species or several types of plants in a year on the same land can be done with the system of intercropping is done between annual crops and annual crops which is mutually beneficial, for example between corn and beans. One type of family *Leguminosaceae* that can be intercropped with corn, green beans and peanuts.

Corn (*Zea mays L.*) is a food crop that has an important role as a source of carbohydrates and protein. Local corn has a large contribution in increasing domestic food production, but its productivity is still low. The low yield of corn is due to the use of seeds and farming technology and cultivation that are still less intensive (Rahayu *et al.*2003). Increased corn production can be achieved by increasing the planting area and increasing productivity (intensification). However, with limited land, the way to increase corn through increased productivity is a more reality choice (Hatta 1999).

One effort that can be done to increase corn crop production is to choose the right cropping system. The cropping system can be done with monoculture or polyculture. Monoculture planting is felt to be less profitable because it has a large risk, both in the balance of available nutrient elements, and the condition of pests disease that can attack the plant explosively so that it fails the harvest (Sutoro *et al.* 1988).

The demand for peanuts is still relatively low when compared to other legume crops such as soybeans and peanuts, but in terms of peanut prices have a high selling value. Therefore, the cultivation of peanuts can be done with a system intercropping, where peanuts can be used as an inset plant between rows of corn plants. The combination of corn-beans and green beans in intercropping is usually done with single row or double row (10-12 rows), known as intercropping of rows or grooves (Van der Maesen 1993).

The application of planting patterns intercropping system is strongly influenced by the regulation of planting distance (density) and selection of varieties. According to Sitompul & Guritno (1995), setting spacing is one way to create the factors needed by plants to be available for each plant and to optimize the use of available environmental factors. According to Sutoro *et al.* (1988), an increase in corn production can be done by improving plant density (plant spacing). Increasing the level of plant density per unit area to a certain extent can increase seed yield. Conversely, a reduction in the density of corn per hectare can result in microclimate changes that affect growth and yield. According to Rubatzky & Yamaguchi (1998), the average planting distance of maize is generally 20-25 cm in rows and 75-90 cm between rows.

Based on the description above, Madura farmers, especially in Kampao Village, Blega Subdistrict, Bangkalan Regency, planted with various varieties, including local maize that were

interspersed with peanuts and their interaction with the growth and yield of both plants, is a problem to be examined.

## **2. RESEARCH METHODOLOGY**

This research was conducted in the Rainfed Field in Kampao Village, Blega District. The material used in this study was corn seeds and peanuts are local varieties of seeds. The fertilizer used is Urea inorganic fertilizer. The tools used are tractors, hoes, rakes, machetes, fansticks, sitting scales, meters and stationery. This research method is an experimental study (true experiment), defined as the method used to look for the effect of certain treatments on others under controlled conditions. In this case the writer uses the control class as a comparison so this study can also be called a pure experiment. This method is used on the basis that the nature of experimental research is to try something to find out or the consequences of a treatment. Besides that the researcher wants to know the effect of the independent variable on the dependent variable that is investigated or observed.

Regarding this experimental method Sugiono (2008: 3) argues that "in general the research method is defined as a scientific way to obtain data with specific purposes and uses. And experiments according to Sugiono (2008: 107) is a study that is used to find certain treatments for others in controlled conditions. In addition, according to Arikunto (2010: 16) the research method is a method used by researchers in collecting research data. And experiments according to Arikunto (2010: 3) are a way to find a causal relationship between two factors that are intentionally caused by researchers by reducing or setting aside other factors that interfere. Based on the research method the researcher used an experimental method. So the experimental research method is a series of experimental activities with the aim to investigate something or a problem in order to obtain results. Therefore, in the experimental method there must be a factor that is tested, in this case the factors that are tried circuit training and training intervals to know the effect on that is VO<sub>2</sub>Max. To determine the effect of circuit training and interval training on VO<sub>2</sub>max, a research instrument in the form of a Bleep test containing the element of sports branching, especially the basketball branch.

### **2.1 Growth and Yield Observation Corn**

Plant height (cm). Plant height is measured starting from the base of the stem that has been marked to the tip of the highest leaf. Measurements were made at ages 30 and 45 HST. Diameter of stem base (cm). The diameter of the base of the local cornstalk is measured at the age of 30 HST, at the bottom base near the marked surface of the soil. The length of the cob with a knot (cm). The measurement of the length of corn cobs is done by measuring the length of each cob on each sample

plant at harvest. Weight of cob with weight per plant (g). Weighing the weight of corn cobs on each sample plant, carried out at harvest.

## **2.2 Growth and Yield Observation Peanut**

Plant Height (cm). Plant height is measured from the base of the stem near the surface of the soil that has been marked to the highest growing point. Measurements were made at the age of 15 HST. Number of Productive Branches per Plant (fruit). The number of productive branches per plant is calculated based on the branches that produce pods, observed at 50 HST. Weight of 100 pithy seeds. The weight of 100 grains of seeds is obtained by weighing 100 grains that have been dried, which are taken randomly from each treatment.

## **3. RESULTS AND DISCUSSION**

### **3.1 Planting Distance Between Local Corns in the Overlay Sari System with Peanuts against Corn Growth and Yield Peanut**

The experimental results showed that the spacing between local maize rows significantly affected the height of local maize at ages 25 and 40 HST, stem diameter diameter of 15 and 30 HST, cob length and weight of cob with cob. The average height of local corn plants aged 25 and 40 HST, stem diameter diameter of 15 and 30 HST, the length of the cob and the weight of corn cobs with corn.

Furthermore, the distance of local corn planting has a very significant effect on the height of peanut plants at the age of 15 HST, the number of productive branches and the weight of 100 grains of peanut seeds. The average height of peanut plants aged 15 HST, the number of productive branches and weight of 100 grains of peanuts due to the distance of planting corn in intercropping systems with peanuts.

It shows that the distance of local maize in the intercropping system with peanuts is very significant. The results in the field experiments show the average height of plants aged 30 and 40 HST, diameter of base of stem age 15 and 30 HST, length of cob and weight of corn cobs with local corn due to plant spacing between local maize on intercropping system. The average height of peanut plants at the age of 15 HST, number of productive branches per plant and weight of 100 grains of peanut resulted in the spacing between local maize lines in the Tumpang Sari system on peanut growth and yields were significantly different. To increase growth and yield of both plants. This is in accordance with the opinion of Sitompul & Guritno (1995) which states that planting spacing is one way to create the factors needed by plants to be available equally for each individual plant and to

optimize the use of available environmental factors. The results showed that for local maize plants, growth and yields were obtained if the spacing between local maize lines was widened to produce excellent growth and yield, while in peanuts the spacing between local maize lines widening the distance between local maize lines did not cause changes in growth and tangible results for peanuts.

The higher the density of a crop will lead to the greater level of competition between plants in obtaining nutrients and light (Jumin 2002). In this study, the growth of local maize plants (plant height and stem diameter) proved the truth of this opinion. Where at the age of 30 HST the difference in spacing between local maize lines caused a noticeable difference both in plant height and in the diameter of the base of the local corn stalk. The occurrence of this apparent difference is presumably due to competition occurring below the surface of the soil (roots), because the leaves do not yet shade each other.

Sitompul & Guritno (1995) states that the amount of nutrients and water that can be absorbed by plants depends on the opportunity to get water and nutrients from the soil. Furthermore Gardner *et al.* (1991) states that growth factors stimulating differences not only exist in genetic control (internal), but are also caused by climate, soil and biological elements such as pests, diseases and weeds and also the influence of intraspecies and intra-competition species. Fitter & Hay (1991) added that the reduction in nutrient supply to shoots caused by root competition will reduce shoot efficiency and consequently will reduce the flow of assimilation results to the roots and can disrupt the function of the roots and subsequently can disrupt the generative stage.

Good vegetative growth also results in improved generative growth, as can be seen from the length of the cob and the weight of the local corn cobs. This is presumably because at the planting distance, there was no significant competition between the leaves of the plant in getting the sunlight needed for the photosynthesis process. According to Purwono & Hartono (2005), local corn plants need sunlight especially light intensity. Corn plants that are shaded / overshadow each other, their growth will be inhibited and languished, so the results of seeds that are formed are not good, even cob can not be formed.

Peanut plant growth was not significantly affected by differences in planting distance between local maize rows, but the results were significantly affected by the weight of 100 grains of pith. This is thought to be caused by the use of water, nutrients, light in the maximum growing space at the beginning of planting (Purwanti, Hidayati, & Nurlina, 2017). But in the end the appearance of each tanama individually declined due to competition in getting light and other growth factors. Plants respond by reducing the size or parts of plants (branches, tubers and pods).

### **3.2 Local Corn Varieties in the Intercropping System with Peanuts for Growth and Yields of Local Corn and Peanuts The**

Results showed that local corn varieties in the intercropping system with peanuts significantly affected the height of corn plants aged 30 and 45 HST, the length of local corncobs and the diameter of the local corn cobs are. The average height of maize plants aged 30 and 45 HST, the length of local corn cobs are contoured and the diameter of local corn cobs are contoured.

Furthermore, local corn varieties significantly influence the height of peanut plants aged 15 HST and the diameter of the base of the stem of peanut. The average plant height and diameter of the base of the 15-year old HST, due to the influence of varieties peanuts local maize on intercropping systems with peanuts. This maize yield is quite good, this happens because each variety has different genetic makeup and the ability of the variety itself to adapt to its growing environment so that it still produces good growth and maximum results. According to Simatupang (1997) that the high production of a variety is due to the variety being able to adapt to the environment. Although genetically the other varieties have good production potential, but because they are still in the stage of adaptation, their production is lower than they should.

Peanuts only show a significant difference in local corn varieties at height and diameter of the base of the stem age 15 HST, where the height of peanut tends to be higher and the diameter of peanut tends to be greater. This is caused by the diversity (heterogeneity) of the seeds used even though they have been chosen carefully. According to Sitompul & Guritno (1995), one of the factors that determines the quality of planting material is the number of substrates such as carbohydrates available for metabolism that support the initial growth of plants.

For all yield parameters, the average height of maize plants aged 15.30 and 45 HST, length of cob cobs, weight of local corn cobs in intercropping system and average plant height and base diameter of 15 HST peanut stems due to the influence of varieties local corn in the intercropping system with peanuts while the average weight of local corncobs weighed due to the distance of local corn planting and varieties local corn in the intercropping system of local corn and groundnuts.

Seen the significant difference due to the influence of local corn varieties only occur in corn plants. Whereas in peanut plants there was no significant difference. The differences that occur in the local corn yield parameters are more due to the use of different varieties and indirectly affect the yield, in addition to environmental factors where the growth is in accordance with the conditions of the land that can maximize yield. From the results of research Madura corn is able to adapt to the environment even though it is planted with intercropping system growth and yields are very good because Madura corn is generally harvested earlier after that harvested on peanuts.

Whereas farmers in the village of Kampao always use the intercropping system, one of the reasons for farmers is the use of land when the distance is too wide, the growth and yield of local corn and peanut are not significantly different in growth and yield. the difference in the number of seedlings per planting hole on the growth and yield of rice plants (*Oryza Sativa L.*) using the Sri method. (Ali, Hosir, & Nurlina, 2017).

### 3.3 Interaction

The experimental results show that there is a very real interaction between the planting distance of local maize in the intercropping system with peanuts to the weight of local corn cobs. The average weight of local corncobs is caused by the distance of local corn planting and local corn varieties.

Shows that the weight of local corn cobs rotate per plant for each variety, responds differently to each change in spacing between local maize rows. In Madura corn, the weight of cob cobs per plant did not change significantly with the widening of the spacing between local maize lines.

This causes if the maize varieties are planted with relatively tight spacing and are showing low yields due to competition in getting various growth factors. Furthermore, if planted with spacing that rarely gives significantly higher yields due to all the growth factors needed are sufficient. According to

Welsh (1991) in Hakim (2008) states that the result is the success of plant genotypes that provide maximum expression in overcoming environmental factors.

Furthermore Dahlian *et al.* (2001) in Hakim (2008) stated that crop yields are expressions that are influenced by genetics, environment and their interactions. The expression will be perfect if it is in an optimal environment. The quantitative aspects of the interaction between varieties and the environment are evident in the yield characteristics. This yield characteristic is often an indicator of the size of the environmental influence on the variety of a plant.

### 4. CONCLUSION

Plant spacing between local maize lines in the system intercropping significantly influences the height of corn plants, stem diameter, cob length and weight of cob with cob. The spacing between local maize lines in the intercropping system has a very effect significant on the height of peanut plants aged 15 HST, the number of productive branches and the weight of 100 grains of peanut seeds. Results tend to be better obtained with spacing. Local maize varieties in intercropping systems have a very significant effect on the age of corn plants, the length of cob cobs and the

diameter of the cobs. Local maize varieties on intercropping systems have a very significant effect on peanut plant height.

## SUGGESTION

It is recommended that intercropping systems are only applied to local varieties, planting with intercropping systems, especially in the village of Kampao, sub-district of Blega on corn and peanuts, must use local seeds or seeds.

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