# Tanimbar Rounders Type (TaRT): A Farming Development Model of Small Island in West Southeast Maluku Regency

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**ABSTRACT:** Farming system conducted by Tanimbar Ethnic in West Southeast Maluku Regency, Maluku Province, was still traditional, based on local knowledge, and giving emphasis on food availability for household. Research was aimed to describe farming development model and to analyze the strength of the model in terms of social and economical aspects. Method of research was qualitative. Deep Interview and Focus Group Discussion were the options of research strategy. Informants were selected using snowball technique. This selection from sampel villages was made in pursuance of the direction given by Field Extension Officer (PPL). This officer was key informant from whom other informant was identified. Result of research showed that Tanimbar Rounders Type (TaRT) Model had some benefits. It could restrain shifted-farming, intensify fixed-farming that would provide regular income for farmers, and resolve the issue of limited water for the plants. There were 60% farmers supporting the model and who were also willing to spare their land for Plot Demonstration (Demplot) of TaRT Model. Some commodities were cultivated and managed into a planting cycle as described within TaRT Model. These commodities included vegetables, tubers, dry land rice, and legumes, and sometimes, it was supported by animal husbandry. This model was considered as reliable to develop if referring to BCR = 2.31 (> 1) and because the average annual income reached IDR 32915000 or IDR 1097166 per planting season (0,5 hectare).

**Keywords:** Tanimbar Rounders Type (TaRT) Model, Farming System, Farming Development, Small Island



## INTRODUCTION

### 1. Background

Farming system in West Southeast Maluku Regency (MTB Regency), Maluku Province, was traditional. The system still relied on local knowledge and had been successful in supporting the livelihood of the community in Tanimbar Islands, MTB Regency. Its plant area was one of main advantages in this region. Plant could be directly cultivated Without Land Processing (WLP), or only with Minimum Land Processing (MLP), or without synthetic external inputs such as synthetic fertilizer and inorganic fertilizer. Such cultivation system could also maintain genetic strength of main foods, such as rice, corn, peanut, green bean, cassava, purple tuber, taro, and few minor legumes. However, this system was actually shifted-farming that was always vulnerable to the effect of erosion and the loss of soil nutrient (Pattiselano et al, 2015).

Planting pattern in MTB Regency depended greatly on rainfall pattern. Laimeheriwa (2014) asserted that rainfall pattern in MTB Regency was usually bimodal. In the first mode, rainfall rate was exceeding 200 mm and occurred from the middle of December until the end of April (more or less 4 months). The second mode was short-term from the middle of May to the early of July (more or less 1.5 months). However, if taking account the remaining water after the rain, then, the water available in the soil was adequate to satisfy plant demand for water until the early of August.

Farmers in MTB Regency urged their generations to conserve genetic diversity of various plant species based on the trend of rainfall pattern. In general, during the practice of shifted-farming, farmers cultivated newly-opened land for coconut on December. At the interval of coconut trees, farmers planted tubers, rice and corn. Banana was planted at the border of the garden. The species of tubers included cassava, taro, and other kinds of edible tubers. Rice and corn were harvested on April, and the land that was planted previously with rice and corn, would be cultivated for legumes. Some species of legumes were planted, such as green bean, peanut, and red bean. Legumes were harvested on August. In the middle of August and October, tubers were harvested along with corn and rice. After harvesting tubers and legumes, the same land was prepared for other tubers, such as taro and cassava which would be harvested on June and July at the next year. Banana was harvested on December. Such planting order was kept continuous for more or less 2 years before the garden was abandoned. If coconut was ignored, or if the crown of banana and coconut did not yet shade the soil surface, then taro was possibly planted once again after harvesting taro and cassava on June and July.

### 2. Problem Formulation

Although traditional farming system with crops and fruits was still backward, vegetable farming showed good progress. MTB Regency had witnessed the emergence of many forms of vegetable farming which was typically fixed farming with regular cultivation throughout a year. The cultivated plants involved tomato, chili, eggplant, papari, kangkung, spinach, chick pea, string bean, petai, and cucumber. Time interval in planting the commodities had been set in good arrangement, and the harvest could be sent to the market without unnecessary break. Plant rotation was managed properly to break down the life cycle of critical pest. Khalid, Dhaka, Bhagat, Satish, and Jitender (2016) inferred that intercropping system was actually benefiting but the variance of commodity also determined the aspect of economic feasibility. Often, farmers did not understand what proper strategy to develop their land. This was aligning with Navdeep, Prabhjot, and Pankaj (2016) who revealed that farmers in Patiala District faced hardiness in developing their farmland due to lacking of information.

BPS of MTB Regency (2015) explained that crop farming that was managed in fixed-period and continuous way in a year could still be improved into the better farming. It was indeed shown that such traditional agro-ecosystem, which always ended with coconut planting, was likely reducing the availability of the flat land suitable for crops and vegetables. Land area for the coconut in MTB Regency had reached 25,242 ha, larger than the protected forest which only covered 10,445 ha. Proper approach was then needed to strengthen crop farming using cultivation technology that conserved soil fertility and also that saved the use of water. As shown in the overview, the formulated problem was “what was the proper model of farming development in MTB Regency?”

### 3. Research Objective

Research was aimed: (a) To describe the proper farming development model in MTB Regency, and (b) To identify the strength of this model based on its socio-economic aspect.

## METHODOLOGY OF RESEARCH

### 1. Time, Location of Research, and Sampling Method

This research was using qualitative approach and it was conducted in West Southeast Maluku Regency. Two villages were purposively selected as the sample, precisely in Kelaan Village in North Tanimbar District and Latdalam Village in South Tanimbar District. The sample village was selected after examining the regional development plan made by the Official of Agriculture in MTB Regency that insisted to establish Agropolitan Region on these two villages. The community of these two villages was dominantly working on farming activity.

Research was done for a month, respectively in November 2016. The population of research included farmers in two villages. The informants were farmers as patriarchs (head of household). Seven informants lived in Kelaan Village while eight informants stayed in Latdalam Village. In the early stage of research, to obtain information, the author asked questions to key informant in each village, and this key informant was Farming Extension Field Officer (PPL). Snowball Technique, as explained by Moleong (1989), was used to identify other informants. Data were collected with deep interview to obtain information related with this research.

## 2. Method of Data Collection and Data Analysis

Some techniques of data collection were used. One was questionnaire given to respondents (Babbie, 2004; 184) to collect primary data, and other was deep interview with key informants (Moleong, 1989; Debus and Noveli, 1996). Participative observation (Moleong Moleong, 1989, 1989; Denzin dan Lincoln, 1994; Babbie, 2004) was also conducted, and it required the author to engage directly into daily life of the community by hearing and discerning what had been said and done by the community as research subject.

Simple Tabulation was used for data analysis that described the condition and characteristic of research location. The collected data were processed and presented into table and diagram to facilitate the analysis. Miles and Huberman (1992:15-21) had suggested three stages of qualitative data analysis. First stage was reducing the data continuously through processes, such as selecting the data, centralizing attention to the selection, simplifying the data, making the abstract from the data, and transforming the data from informants on the field into more understandable forms. Second stage was collecting information about what problems were faced by farmers and what the farmers might expect. This information would facilitate the making of conclusion and the taking of action. Third stage was verifying the conclusion about the farming development model that had been made.

## RESULT AND DISCUSSION

## 1. Model Tanimbar Rounders Type (TaRT)

Reinforcing a system was an action to defend the leading capacity of the system and to develop innovation to resolve the weakness using new technology that could improve productivity and ensure the sustainability of the farming. The reinforcement of this traditional system, in form of bio-intensification, was involving intensive farming that used biological materials and managing the environment to reproduce natural, productive and sustainable farming ecosystem (Jambormias, 2016). It was expected that plant productivity could be improved to produce local superiority. Some technologies that used biological materials were already available and these were important to recover natural farming ecosystem. These technologies were: fertilization with greenings, alley-cropping with legumes, and crop-livestock integration (agropasture). All these technologies provided opportunity to the conduct of farming ecosystem to bring back farmland productivity.

The procedures in TaRT Model were included:

- Planting area was divided into four square plots. Planting Season (MT) was set into specific order. Livestock plot stood in the middle of planting area (See Figure 1). This plot had a field for the herding, and this field was grown with species of grasses such as: Cynodon nlemfuensis and Crotalaria juncea. Livestock waste was retained into the pool, and the water of this pool was useful to be the liquid fertilizer for commodities in all planting plots. The border of planting plots was marked with banana (the black line in Figure 1).
- The opening of one plot (Plot 1) was starting at MT1, and the next plot was planted at MT2, and the final plot was cultivated in MT3. Planting season cycle at MTB Regency was intensified into three times a year.
- The commodities that were planted at MT1 included: corn, red rice, and tubers. Corn and red rice were harvested in three months. Tubers were harvested in eight months, but tubers were only planted in the beginning of Planting Season.
- After harvesting rice and corn of MT1, both crops were planted again in the next plot (Plot 2). Tubers were planted and not harvested until the next eight months. Plot 1 was cultivated for vegetables at MT2.
- After MT2 harvest, rice and corn were replanted on next plot (Plot 3) while vegetables were set on Plot 2. In other hand, Plot 1 received legumes. Entering MT3, tubers were harvested in Plot 1 along, at same times, with legumes and vegetables in Plot 2, and also with rice and corn in Plot 3.

- After-Harvest or Post-Harvest Period meant as having competed one planting season of a year, and starting to enter the next planting season. The second year of MT1 started with Plot 4 (Final Plot) that was planted with corn, red rice, and tubers. Vegetables were planted in Plot 3, whereas legumes were put at Plot 2. In this case, Plot 1 was rested for 3 months to recover soil nutrient. Plot 1 could also be set for legumes to increase soil nutrient.
- The rotation of plants was done in every order of plot planting. Resting period was given for recovering soil nutrient. Each plot would get its turn for resting. Such farming model could maintain fertility of each plot due to the effect of planting rotation. Each plot would have its chance for recovery. Land intensification was achieved amidst the persistence of the culture of shifted-farming professed by the community.

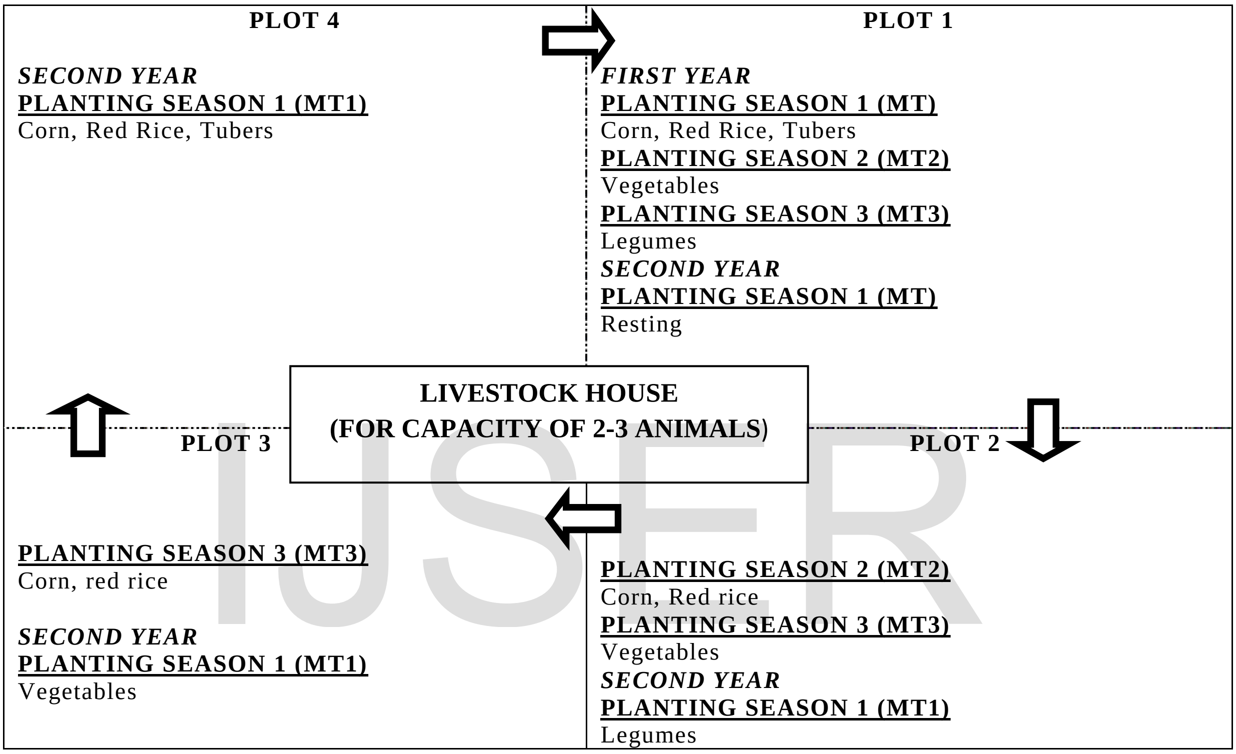


**Figure 1.*Tanimbar Rounders Type* (TaRT) Model**

Tanimbar Rounders Type (TaRT) was also capable to be used to improve soil fertility. This technology allowed the production of plants to be continued. Soil nutrient was provided by green fertilizer, livestock waste, and pool below livestock house in rounder type (Figure 1). Few things in the following must be put into consideration in applying TaRT Model.

- Livestock house must be equipped with the pool at diameter 3 x 3 meters and this pool was functioned as nutrient pool. This pool would contain livestock wastes from livestock house beneath the pool.
- Herding field was surrounding the nutrient pool, and the size was 0.04 ha (including nutrient pool). The herding field was made exclusive for cattle.
- Herding field was planted with grass species such as Cynodon nlemfuensisand Crotalaria juncea.
- The planting of gamal, lamtoro and Traphrosia vogelliwas done in rows. The interval of planting was 4-5 meters. After reaching 1 year age, trees were trimmed more-or-less 50 cm above land surface. Trimming was done 3-4 times in a year (dotted line in Figure 1).
- The cuts from trimming could be processed into several products. It could be fermented into water taken from nutrient pool to produce liquid fertilizer. It was buried into the ground to produce green fertilizer. It might be mixed with other greens to produce compost.

- The plots were planted with crops, such as vegetables, legumes, red rice, and tubers. Planting rotation was applied, and the initiation point for each planting plot was red rice and corn.

As explained in TaRT Model, Planting Season Calendar of farmers in MTB Regency had been changed. This change could be seen in Table 1.

Table 1. Planting Calendar in TART System for Bio-Intensification Involving Crops, Vegetables, and Livestock in MTB Regency

<table>
<tr><th rowspan="2">Plot</th><th colspan="12">Month</th></tr>
<tr><th>12</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th></tr>
<tr><td rowspan="3">I</td><td colspan="10">-------------------------- Tubers -------------------------</td><td colspan="2">Resting</td></tr>
<tr><td colspan="4">Corn + Rice</td><td colspan="4">Vegetables</td><td colspan="4">Legumes</td></tr>
<tr><td colspan="12">------------------------- Banana (Garden Border) ----------------------------</td></tr>
<tr><td rowspan="2">II</td><td colspan="3">Legumes</td><td colspan="4">Corn + Rice</td><td colspan="3">Vegetables</td><td colspan="2">Resting</td></tr>
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<tr><td colspan="12">------------------------- Banana (Garden Border) ----------------------------</td></tr>
</table>

**Source : Result of Research (Processed, 2016)**

**2. Improving Water Stock To Support Water System**

Water was a main factor determining growth and production of the plants. The development of a farming system without water supply would be useless, especially during dry season. Main water source for the plants was usually irrigation water. In general, irrigation water was derived from river stream, water reception at dead river, embankment, and artesian well or dril well. However, when irrigation water source was unavailable, specific technology was then needed. Water was harvested during rain season to be made available in dry season. One such technology was the making of biological pores to be filled with plant manures combined with compost and organic mulches to create soil humidity that reinforced the availability of water for plants (Fordatkosu, 2013).

In the islands with river stream, including Jamdena Island, there was a time when farmers would use river water (including the water reception at dead river) to irrigate their field on dry season. In small islands without river, farmers made embankments or artesian well for water stock when entering dry season. In every water system with at least 20 households, one embankment might be adequate for MT1, MT2 or in the end of dry season.

**3. Work Feasibility Analysis on Leading-Commodities Farming**

Work feasibility analysis was important when crop producers or farmers insisted on reducing the possibility of loss or also increasing the feasibility of their work. One type of such analysis was Benefit-Cost Ratio (B/C Ratio). To facilitate the analysis, action plan was set on the land width of 1 hectare.

Based on this review, some commodities were considered as having the leading quality, and must be cultivated by farmers. It could be crops or horticultures (fruits and vegetables). This research analyzed each commodity cultivated by farmers, and the result of analysis would be a strong reference for farming management in the future.

Result of feasibility analysis indicated that the commodity had Benefit-Cost Ratio (B/C Ratio) bigger than 1 (B/C > 1). This indicator meant that commodities were feasible because it gave reasonable profits on economical aspect. Main commodities cultivated by farmers were:

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corn, peanut, purple tuber, cassava, dry-land rice, sweet potato and banana. Benefit-Cost Ratio that was obtained was more than 1, or precisely 3. B/C ratios of the commodities were described in bracket such as: banana (3.48), peanut (3.22), purple tuber (3.23), and dry-land rice (3.36).

Consistent to this farmland development, Tanimbar Rounders Type (TaRT) was suggested. This model delivered some benefits. It helped preventing further occurence of shifted-farming usually done by farmers. This model also gave great emphasis on plant rotation that would improve production continuity that might benefit the income of farmers. The benefit of this model was also observed in the result of multiple-cropping (polyculture) between dry-land rice, peanut and purple tuber (see Table 3). Similar finding was given by Khalid, Dhaka, Bhagat, Satish, and Jitender (2016) who stated that intercropping system could be the best choice to improve the benefit of farming and also the efficiency in using the resource if compared to monoculture system. Aditi, Rede, and Malthane (2016) found that farmers gave big contribution to the nation. Food supply was warrantied by farmers. But, to ensure this warranty, farmers must have access to land and water, and also to village financial service to pay their production inputs and factors. Waghmare (2015) verified that the income per hectare for peanut was increasing. Farming conservation in the peanut cultivation and also its combination with mulch technology, played important role to increase plant production and to stabilize farmer income. As reported by Karelakis and Tsantopoulos (2016), the determinant factors encouraging farmers to adopt farming alternatives were: the improved knowledge of farmers, the increasing demand for product in the market, the establishment of farming cooperative, the promotion of alternative products, the education and knowledge about alternative plants, and the adequacy of land owners' income.

Table 2 below showed that most farmers supported the applicationof TaRT Model and indeed expected the immediate implementation of Plot Demonstration (Demplot). However, some farmers were hesitated and decided to wait the result of Plot Demonstration. The remaining did not have interest on TaRT Model. Farmers in latter group mostly had side job as the lumberjack in the forest. The profession of lumberjack was greatly depending on shifted-farming system, in which the forest must be open and cultivated as garden. It would be understandable when TaRT Model was applied, shifted-farming decreased. As consequence, side-income from being lumberjack also declined. The distribution of respondents based on their view about TaRT Model was described as following:

**Table 2. Respondents' View about TaRT Model**

| No | Respondents' View | Number of Respondents (Person) | Percentage Point (%) |
|---|---|---|---|
| 1 | Supporting and engaging into Demplot. | 9 | 60.0 |
| 2 | Hesitated and waited for the result of Demplot. | 4 | 26.7 |
| 3 | Not interested. | 2 | 13.3 |
| | Total | 15 | 100.0 |

Source : Result of Research (Processed, 2016)

Feasibility Analysis (BC Ratio/BCR) was conducted against each commodity in the TaRT Model. The income that derived from each commodity was shown in the table.

**Table 3. Feasibility Analysis on TaRT Model and Income**

| No | Commodity Type | BC Ratio | Income (IDR/Year/0,5 Ha) |
|---|---|---|---|
| 1 | Banana | 3.48 | 15,128,125 |
| 2 | Peanut | 3.22 | 19,075,000 |
| 3 | Spinach | 3.23 | 15,272,500 |
| 4 | Purple Tuber | 3.02 | 18,775,000 |
| 5 | Red Rice (Shifted-Farming) | 3.36 | 19,400,000 |

Source : Result of Research (Processed, 2016)

Based on the table, it could be said that all commodities were feasible for cultivation (BCR > 1). Banana was a commodity with the highest BCR. The price of banana per bunch was IDR 50,000. Banana commodity in MTB Regency was purchased by the Collector Trader around the Regency and sold to Timika (Papua) at price of IDR 150,000 per bunch. Therefore, banana was the favorite commodity among collector traders.

Farmer income when TaRT Model was applied onto five leading commodities was advancing into very promising level. Monthly income attained around IDR 15.128.125 – 19.400.000. This income must be feasible if compared to Minimum Income for Maluku Province in 2016 that only reached IDR 1,750,000. Feasibility Analysis on TaRT Model for all commodities was explained in the following table. Similar finding was given by Anurag and Mini (2016), to follow up the practice of using dung to make cakes and farm yard manure that would have been otherwise washed away. Furthermore local unemployed and poor families can make self help groups and take these practices to free themselves off the clutches of poverty.

**Table 4. Feasibility Analysis in Polyculture (Dry-land Rice, Peanut, Tubers, and Vegetables) per 0,5 Hectare**

| No. | Cost/Benefit | Measure | Volume | Rp/Unit | Total | Percentage |
|---|---|---|---|---|---|---|
| 1. | Farming Tools | | | | | |
| | 1.1. Hoe | Unit | 3 | 75000 | 225000 | 1,86 |
| | 1.2. Mattock | Unit | 2 | 75000 | 150000 | 1,24 |
| | 1.3. Sprayer | Unit | 1 | 500000 | 500000 | 4,14 |
| | 1.4. Crowbar | Unit | 2 | 75000 | 150000 | 1,24 |
| | 1.5. Scraper | Unit | 3 | 50000 | 150000 | 1,24 |
| 2. | Land Preparation | | | | | |
| | 2.1. Slash-Burn | HOK | 13 | 50000 | 650000 | 5,38 |
| | 2.2. Pest Control | HOK | 10 | 50000 | 500000 | 4,14 |
| | 2.3. Soil Management | HOK | 12 | 50000 | 600000 | 4,96 |
| | 2.4. Planting | HOK | 33 | 50000 | 1650000 | 13,65 |
| 3. | Seed | Kg | 5 | 50000 | 250000 | 2,07 |
| 4. | Fertilizer | | | | | |
| | 4.1. Urea | Kg | 85 | 6000 | 510000 | 4,22 |
| | 4.2. TSP | Kg | 300 | 6000 | 1800000 | 14,89 |
| | 4.3. KCl | Kg | 300 | 6000 | 1800000 | 14,89 |
| 5. | Maintenance | HOK | 20 | 50000 | 1000000 | 8,27 |
| 6. | Harvest | HOK | 12 | 50000 | 600000 | 4,96 |
| 7. | Post-Harvest | | | | | |
| | 7.1. Cleaning | HOK | 8 | 50000 | 400000 | 3,31 |
| | 7.2. Transporting | HOK | 10 | 50000 | 500000 | 4,14 |
| 8. | Marketing | OH | 13 | 50000 | 650000 | 5,38 |
| | Total Cost from 1-8 | IDR | | | 12085000 | 100,00 |
| 9. | Income | IDR | | | 40000000 | |
| 10. | Net Earning | IDR | | | 32915000 | |
| 11. | B/C | | | | 2,31 | |

Source : Primary Data (Processed, 2016)

## CONCLUSION

1. Farming development in West Southeast Maluku Regency was hampered by three aspects, respectively the shifted-farming (depending on the season), the vulnerability to nutrient loss, and the limited water source. Therefore, a specific development model was needed to restrain the occurence of shifted-farming, to intensify fixed-farming to provide regular income for farmers, and to resolve the issue of limited water for the plants. TaRT Model applied plant rotation system involving tubers, vegetables, rice and legumes, with the

presence of livestock. The selection of crops and livestocks was based on its suitability to cultural character of farmers and its physical condition (agro-climatology). Both were the base for the growth of the plants.

2. The farming development model that was offered as problem solution was Tanimbar Rounders Type (TaRT) Model. This TaRT Model was used to produce intensive farming system in perpetual manner in a year (or four months in a planting season). This model was feasible to be developed because the analysis had found BCR = 2.51 (feasible because > 1). The average income had reached IDR 32915000 per year, or was equivalent to IDR 10971666 per planting season (0,5 hectare).

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