Mobile App for the Prediction of Bananas Harvest

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Abstract

This study had the objective to use mathematical modeling of existing functional relationships between meteorological factors and the gestation time of 'Nanicão' banana bunches to develop a model capable of predicting the harvest time, through multiple linear regression and apply this theory in a mobile application on the Android platform, in order to assisting producers in decision making.

Keywords: *Agriculture 4.0, Musa acuminata 'Dwarf Cavendish', mathematical modeling, harvest time.*

1. Introduction

Brazil has been consolidating itself on the world stage as a promising fruit producer with a world production of 114 million tons of bananas in 2019 (Zafalon and Kastner, 2019), according to FAO data (2017), with total production in that year of6,675,100 million tons. Banana tree is characterized by being adaptable to tropical and subtropical climates, with an ideal temperature for production between 15º C and 35º C and average annual rainfall of 1200 mm (Coelho et al., 2016).

Thus, to achieve maximum crop yields and minimize costs and cultivated area, edaphoclimatic adaptation can help achieve these goals. Early detection and management of problems associated with yield due to climatic and weather variables, pest attacks and the occurrence of diseases can help to increase yield and subsequent profit and thus assist in decision-making about harvesting, storage and other cultural tracts.

In 2015, Brazil participated in all sessions of the intergovernmental negotiation related to the consolidation of the Sustainable Development Goals (SDGs) on the occasion of the United Nations Summit for Sustainable Development. At that time, an agreement was reached that contemplates 17 Objectives and 169 targets, involving diverse themes, such as poverty eradication; food security and agriculture; health; education; gender equality; water and sanitation; energy; sustainable economic growth; infrastructure ; reducing inequalities; sustainable cities; sustainable consumption and production patterns; climate change; protection and sustainable use of the oceans and terrestrial ecosystems; peaceful, righteous and inclusive societies and means of implementation (Mundo, 2016).

The present research has insertion and accession in 3 of these global objectives, namely: objective 2 that proposes to end hunger, achieve food security and improve nutrition and promote sustainable agriculture, with agriculture being the largest employer in the world , providing livelihoods for 40% of the current global population and fruit cultivation and banana farming in turn inserted in this context; objective 9, which proposes to build resilient infrastructures, promote inclusive and sustainable industrialization and promote innovation, since according to this objective, in developing countries only 30% of agricultural production goes through industrial processing, and in developed countries 98% is processed. This suggests the existence of a great opportunity for business in the agricultural area in developing countries; and objective 12, which aims to ensure sustainable production and consumption patterns, such as better crop planning and thereby reducing food wasted daily. (Mundo, 2016).

This study aims to investigate the functional relationships between meteorological factors and the gestation time of ‘Nanicão’ banana bunch, in order to develop a model capable of predicting the harvest time, through multiple linear regression. (Montgomery and Runger, 2016) and to use the mathematical function in the development of an application for Android phones, to assist rural producer in carrying out the harvest planning.

2. Material and Methods

2.1 Description of the experimental area

The data related to this study were collected at Fazenda Rancho Mama located in the municipality of Itaí-SP, which has geographical coordinates, 23°31’44.7”south latitude and 49°04’04.8” west of Greenwich and an altitude of 630m, Cwa specific variety climate - according to Köeppen climate classification - humid subtropical with hot summer, hot temperate climate (mesothermal) with rain in the summer and drought in the winter with average warmer temperature over 22ºC, average atmospheric pressure during the period of the evaluations of 928.5 hPa, predominant winds in the directions South-Southeast, South and Southeast, respectively with an average speed of 1.9 m s-1.

The soil in the area was considered as Red Nitosol according to the classification performed (Santos et al., 2018). All cultural treatments related to fertilization, irrigation, pest and disease control were realized in the area whenever necessary.

2.2 Weather data

The meteorological data referring to the maximum, average and minimum temperatures, relative humidity and precipitation were obtained by the National Institute of Meteorology (Instituto Nacional de Meteorologia - INMET), through the Observation and Applied Meteorology Section (Seção de Observação e Meteorologia Aplicada - SEOMA), from an Automatic Meteorological Information System of Surface, comprising the following subsystems: data collection, through sensors that measure environmental variables; of control and local storage in data-logger; of power; of communications; of database and data dissemination to users. Data relating to photoperiods were obtained by means of specific calculations from the geographic location of the banana crop carried out by the Meteorological Station located at FCA-Unesp, Botucatu Campus.

For full development and adequate production, the banana tree, a typically tropical plant, requires a constant temperature around 28ºC, but the range of 15 to 34ºC is considered as the extreme limits for satisfactory exploration of the crop, in addition to well-distributed rainfall and high humidity (Borges & Souza, 2012).

Satisfactory banana production is associated with a total annual rainfall of 1,900 mm distributed throughout the year, that is, representing an average of 160 mm month^{-1} and 5 mm day^{-1}. Brazil has favorable conditions for banana cultivation in almost all of its territorial area, with emphasis on the North, Northeast, Midwest regions, much of the Southeast region and some microclimates of the South region, however the climatic factors directly or indirectly delimit the producing zones, placing them in apt, marginal or inapt (Borges & Souza, 2012).

Ballestero, in (Soto Ballestero, 1992) argues that the luminosity directly affects the banana cycle both in terms of the size of the bunches and in the quality and time of their emission until the harvest. Therefore, a time greater than 2000 hours of sunshine/year is considered as ideal, and as the limit, 1000 hours of sunshine/year. The author shows that for ‘Valery’, ‘Grand Naine’ and ‘Giant Cavendish’ cultivars - in conditions of high light - the average time for fruit development is 80 to 90 days and, in low light regions, the observed values were between 85 and 112 days.

Photoperiodism is the organism’s ability to respond to a specific photoperiod, this being the period between sunrise and sunset, in a specific place and date. In vegetables, in general, photoperiodism influences the flowering phenomenon and, consequently, in the reproductive process and fruit formation. Throughout the year, in regions where the seasons are well defined, there is variation in the length of days compared to nights, with many plants sensitive to these changes. Researches that analyzed the influence of the photoperiod on the different phases of the banana phenological cycle are old and present incipient data. Soto Ballestero (2000) reports that the banana tree does not respond to the photoperiod, being classified as a neutral day plant. However, new approaches have been given by different authors, citing the hypothesis that the plant responds to long days optionally, in the inflorescence emission phase.

It is necessary to know the sun's declination to determine the photoperiod, in other words, the angle formed between the equator plane and the sun's rays reaching a certain location, which, although it varies continuously with time from the meteorological point of view, is considered as a discrete function, that is, unchanged along the day, making the calculation more simplified than the one required for astronomical purposes.

Varejão-Silva (2006), from the study of T. Won in *The Simulation of Hourly Global Radiation from Fourly Reported Meteorological Parameters – Canadian Prairie Area,* recommends the use of Equation 1, for the approximate calculation of the declination of the sun (δ) in degrees:

$$\delta = 0.3964 + 3.631 sin\left(\frac{360D}{365}\right) - 22.97 cos\left(\frac{360D}{365}\right) + 0.03838 sin\left(2\frac{360D}{365}\right) - 0.3885 cos\left(2\frac{360D}{365}\right) + 0.07659 sin\left(3\frac{360D}{365}\right) - 0.1587 cos\left(3\frac{360D}{365}\right) - 0.01021 cos\left(4\frac{360D}{365}\right) \quad (1)$$

Where:

δ: declination of the sun (degrees)

D: number of the day in the year (D = 1,2,3...365)

From sunrise to sunset, and due to the slope inherent to the sun, the earth rotates at a certain angle and, for a given latitude and specific date, the hour angle is determined by Equation 2:

$$H = arc.cos\,(tan\,\phi\delta) \quad (2)$$

Where:

H: hour angle (degrees)

Φ: latitude (degrees)

Briefly, 2H represents the value of the hour angle that the Earth must travel from sunrise to its culmination and, from culmination to sunset. We know that the photoperiod corresponds to that time interval and that the Earth has an angular velocity of 15°/ h, the elapsed time is given by:

$$P = \frac{2H}{15} \quad (3)$$

Where:

P: Photoperiod (hours and hours decimals)

The moment set as the sunrise and the sunset is established by certain conditions of tangent of the edges of the solar discs with the horizon plane the considered local. For reasons that are outside the scope of this study, it is necessary to apply a correction to the formula for calculating the photoperiod, changing it as follows, as explained in (Varejão-Silva , 2006).

$$P_c = \frac{2(0.83° + H)}{15} \quad (4)$$

Where:

Pc: Corrected photoperiod (hours)

2.3 Banana Culture

The cultivar analyzed in this research was the 'Nanicão' triploid of Musa acuminata (AAA) from the Cavendish subgroup, chosen because of the following factors: i) because it is a little more tolerant to cold (about 2°C less) and to the lack of water, its hibernation does not occur at the common 15° C; ii) the emission of the inflorescence occurs naturally, with fewer occurrences of interruptions iii) the symptoms of "chilling" in the plant and in the fruits are less than the other cultivars of the Cavendish subgroup.

2.4 Running the experiment

Data were collected in a six-year-old banana crop, established in November 2005 in an area of 50 ha, with a spacing of 2.40m x 2.10m, under a central pivot irrigated system. Data were collected among the harvests of the years 2011 and 2017/2018.

In the developing of the banana tree, all necessary preparations were made in the soil for correction and fertilization, according to its chemical analysis. Throughout the cycles, all the essential cultural treatments were applied, such as periodic thinning of shoots, cleaning of leaves and management of pests and diseases. In the period of data collected, the control of Yellow Sigatoka (*Mycosphaerella musicola*) stands out by carrying out seven (7) fungicide sprays per year (from October to April), intercalating products belonging to different chemical groups.

In order to analyze the performance of the banana bunches, 50 banana trees were signaled and numbered - divided into one per plot - and the emission data was recorded until the bunches were harvested through personal inspections.

2.5 Multiple Linear Regression Model

From 2011 to 2017/2018, 364 samples of banana gestation (difference between the bagging date and the harvest date) were recorded, as well as a set of meteorological information registered on the bagging day, such as temperature, precipitation, relative humidity and photoperiod, as partially shown in Table 1 (Complete table in Appendix 1).

Table 1 – Banana gestation, harvest and meteorological data.

No.	Gestation (days)	Bagging date	Harvest Date	Temperature (ºC)	Precipitation (mm)	Humidity (%)	Photoperiod (h)
1	96	01/03/2011	04/09/2011	22.7	9.3	83	13.562
2	92	01/10/2011	04/12/2011	23.4	13.5	81	13.502
3	91	01/17/2011	04/18/2011	22.9	18.9	84	13.421
4	114	01/24/2011	05/18/2011	24.8	0.6	72	13.32

5	99	02/01/2011	05/11/2011	22.8	21.7	82	13.199
. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
360	85	11/20/2017	02/13/2018	21.6	7	74	13.343
361	82	11/27/2017	02/17/2018	20.9	9.4	76.3	13.44
362	75	12/04/2017	02/17/2018	23.4	0	70	13.517
363	70	12/11/2017	02/19/2018	23.8	0.7	64	13.572
364	63	12/18/2017	02/19/2018	22.2	17.1	83	13.604

Source: Authors.

A mathematical model is of regression when it connects the behavior of a variable in function of another. A regression model that contains more than one regressor variable is called multiple, and is widely used to adjust the tabulated data in a linear form with the unknown coefficients that follow the regressor variables. In these models, the second degree polynomial regression class and interactions between two regressor variables are included, as shown in Equation 5:

$$G = \beta_0 + \beta_1 D + \beta_2 M + \beta_3 T + \beta_4 Pr + \beta_5 H + \beta_6 Ph + \beta_7 D^2 + \beta_8 DM + \beta_9 DT + \beta_{10} DPr + \beta_{11} DH + \beta_{12} DPh + \beta_{13} M^2 + \beta_{14} MT + \beta_{15} MPr + \beta_{16} MH + \beta_{17} MPh + \beta_{18} T^2 + \beta_{19} TPr + \beta_{20} TH + \beta_{21} TPh + \beta_{22} Pr^2 + \beta_{23} PrH + \beta_{24} PrPh + \beta_{25} H^2 + \beta_{26} HPh + \beta_{27} Ph^2 + \epsilon \quad (5)$$

Where:

G: Gestation of bananas (in days)

β_0, β_1… β_27: Regression coefficients

D: Bagging Day

M: Bagging Month

T: Temperature (° C)

Pr: Precipitation (mm)

H: Humidity (%)

Ph: Photoperiod (h)

ϵ: Random error term

In addition, it is necessary to select an appropriate set of regressors, based on a model that includes all variables, and not all regressors are necessary. Therefore, an analysis should be performed to choose an appropriate model that contains sufficient regression variables for prediction, of low maintenance cost and easy to use.

Several criteria can be used to evaluate and compare the different regression models obtained, we used in this article the analysis of the coefficient of multiple determination (R^2), adjusted coefficient of determination (adjusted R^2), quadratic sum of errors (SQ_E), Mallows' CP and P value.

To adjust the models, the significance level of the regressive variables was used at 5% and concomitant to the P value, which refers to the lowest level of significance for acceptance of the model adopted.

For the resolution of the regression coefficients values, the choice of the best model, and the determination of the aforementioned selection criteria; the Minitab 19 software was used.

In order to have a general idea of the accuracy of the predictions of the adopted model, it is necessary to determine the confidence intervals (CI), which provides the probable values for the average response and also the prediction intervals (PI) that results in the probable values for an answer to an x not belonging to the analyzed data, but which belong to the range of variation studied.

2.6 Agriculture 4.0

Agriculture 4.0 or Digital Agriculture refers to the set of integrated and connected technologies that allow the automation of agricultural processes through applications for cell phones and tablets, software and equipment in order to optimize agricultural production, reduce costs, streamline operations and enable greater food security.

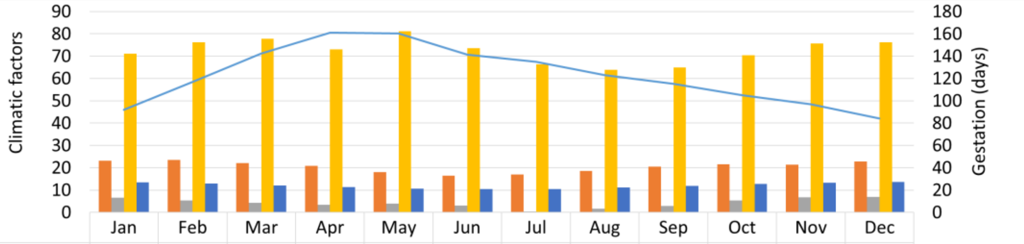
The connectivity of mobile devices is directly related to the concept of IoT (Internet of Things), which adopts computational resources of high technological level, sensors and analysis techniques to generate and process various data that will serve as a basis for rural producers to make strategic decisions more efficiently, due to access to data and tools for daily operations with predictability and harvest planning.

In the present study, an application for mobile device with Android system was developed, on the MIT App Inventor 2 platform, with the GPS (Global Positioning System) location feature applied in the property to collect information about latitude and longitude, being the latitude used for the basis of calculations of the photoperiod, which applied to the mathematical model aims to predict the gestation of bananas and consequently the harvest date.

3. Results and Discussions

3.1 Climatic data and gestation of banana bunches

The behavior of the bunches gestation as a function of climatic factors - such as temperature (ºC), relative humidity (RH%), precipitation (mm) and photoperiod (hours) - can be seen in Figure 1, from the average of 7 years of data collections. It is possible to analyze that in periods of lower temperature, low precipitation and photoperiod, there is an increase in the gestation time of the bunches. Unlike, when the aforementioned climatic factors increase their levels, there is a decrease in the gestation time and, consequently, a reduction of the time of the fruits on the banana trees and optimization of the maintenance costs of the banana crop.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (°C)	23	24	22	21	18	17	17	19	21	22	21	23
Precipitation (mm)	7	5	4	3	4	3	0	2	3	5	7	7
Humidity (%)	71	76	78	73	81	74	66	64	65	70	76	76
Photoperiod (h)	13	13	12	11	11	10	11	11	12	13	13	14
Gestation (days)	92	117	143	161	160	141	135	123	115	105	97	84

Figure 1: Average gestation of banana bunches (secondary axis) according to the average values of climatic factors (main axis). Source: Authors.

In the present study, the average temperature calculated over the 7 years of study was 20.3ºC, with peaks in January of 30.2ºC and minimum in July of 12.5ºC. When calculating the average of monthly temperatures, throughout the year, the temperatures found are within the range of limits for their production showing that the place is ideal for the production of these fruits.

In the region where the samples were measured, the average precipitation over the evaluation period varied from 0.4 mm in July; and values greater than 6.6 to 6.9 mm in the months from November to January. As the banana crop has a central pivot irrigation system, the necessary water demand was supplied when desired.

In this research, relative humidity measurements were calculated varying from 63.8% in May to 81.1% in July. Monthly humidity averages above the recommended were only observed in July, however the lack of humidity and precipitation were supplied by irrigation of the banana crop, making this variable less significant for the study.

As shown in Figure 1, the average monthly photoperiod ranged from 10.4 hours in June to 13.6 hours in December. Likewise, it is observed that under high light conditions (Dec-Jan) the average fruit development time was about 80 days and under low light conditions (May-Jul) the average time was approximately 150 days.

3.2 Mathematical model to predict gestation of banana bunches

Having a model that uses a single linear regression function, in contrast to one developed under the techniques of neural networks (with a much higher number of regressive functions) is interesting and computationally lighter, however studies of mathematical modeling applied to agriculture are still incipient.

From the existing regression models, there are those classified as linear and non-linear models, the last being useful for describing the growth of biological materials over time, as they use parameters of biological interpretation that facilitate analysis (Lúcio et al., 2015).

In the agricultural area, these studies usually assess the entire cycle of a species or growth model according to the application of crop management techniques or comparison between genotypes, as can be seen in Hernández et al. (2007), who studied characteristics of the quality of 'araçá' fruit during growth, development and ripening; Barrera et al. (2008) who studied the physiological development of accessions of different pepper varieties grown in the Amazon; Tarara et al. (2009) who established a dynamic seasonal modeling of canopy and fruit growth in grapevine under different management conditions; Akpo et al. (2014) who studied the dynamics of oil palm growth; and Carson et al. (2014) who analyzed the effect of nitrogen application on tomato production.

A survey of banana fruits was carried out by Etienne et al. (2013) in order to establish a model of the relationship between the acidity of the fruits and their composition during growth and post-harvest maturation from the measurement of the evolution of the organic acids present and found that process-based simulation models are powerful tools for study genotype-environment interactions and design models adapted to the producer / consumer demand.

To assist in the application of multiple linear regression to the analyzed gestation data of banana bunches, the Minitab 19 software was used, in the following steps:

i) Initially, the evaluation of the best subsets to compose the model was evaluated, using the Assistant tool, enabling the obtaining of a mathematical model composed of the variables Day, Month and Photoperiod, as well as the iterations of every two between these variables and also the variable raised to the second power, thus composing a polynomial of order 2;

ii) Then, through an analysis of the normal probability of the residues graphs, (residues of x adjusted values and residues x order of observation), two outliers were found, that is, data that were outside normality and that were causing losses in the interpretation of results of the statistical tests applied to the samples.

iii) Finally, a new modeling was performed, resulting in the equation presented in Equation 18 (rewritten based on Equation 1) with the results obtained from the prediction coefficients.

$$G = -312{,}6 - 1{,}996D - 55{,}04M + 126{,}1Ph + 0{,}1426DPh + 4{,}081MPh - 7{,}133Ph^2 \quad (18)$$

In terms of model adequacy, R2 was 84.3%, R2aj was 84.03% and R2predict was 83.66%, which represents how well the model can predict responses to new observations.

From the pareto's chart of the effects it was possible to compare the relative magnitude and statistical significance of the terms, in decreasing order of the absolute values, as shown in Figure 2, with the reference line highlighted in red indicating the significant terms for the model (with a significance level of 5%, i.e. $\alpha = 0.05$), whose t value ($t\alpha/2$) - used to determine the confidence and prediction intervals - was 1.97.

According to the results shown in Figure 2, the variables selected for the model are statistically significant, considering that they present values above the reference value, with the month (B) being the most prominent (18.5232), due to the variation the sun declination over the days of the year that affect the necessary photoperiod for banana trees in realizing photosynthesis; the iteration month and photoperiod (E) was the second most important factor (17.8005); and the photoperiod raised to the second power (F) was the third highlighted (11.3096).

Furthermore, it is noteworthy that the model presented S values equal to 10.808, Mallows' Cp of 7.0 and p-values less than 5%, as the level of significance used in this project was $\alpha = 5\%$ and with respect to Evans rule (n/k be at least 10), we have that n=362 and k=6, whose relationship resulted in 60.33, that is, the values found are satisfactory for the use of the regression equation.

In order to verify if the model suggested in this study meets the assumptions of the analysis, the graphs of normal probability of the residues, residues x order, histogram of residues and residues x adjustments were verified, as shown in Figure 3.

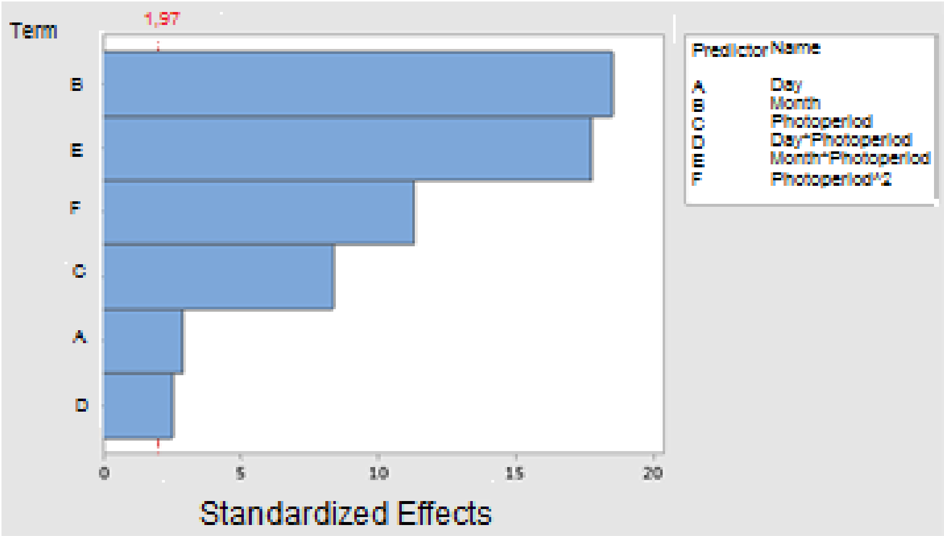


Figure 2: Pareto chart of standardized effects.Source: Authors.

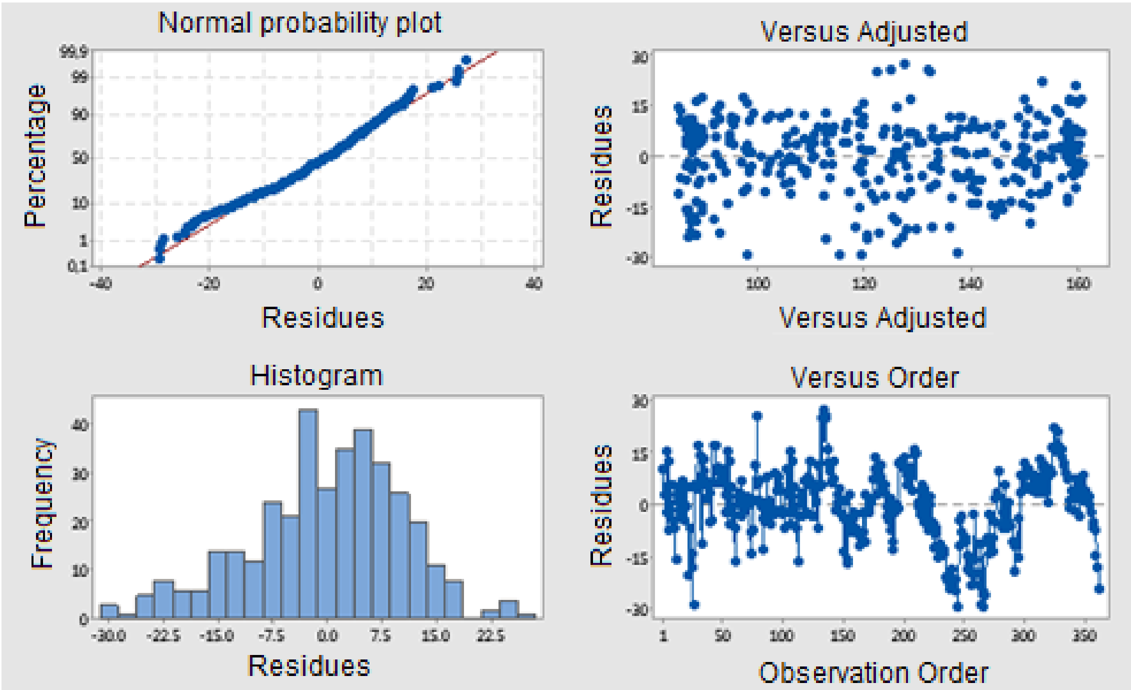


Figure 3: Graphs of Gestation residue. Source: Authors.

The normal probability plot of the residues (upper left side of Figure 3) was used to verify the assumption of distribution of these in order to follow approximately a straight line, thus verifying that there is no evidence of abnormality, outliers or unidentified variables.

Due to the large number of data points (n = 362), the residues histogram (lower left side of Figure 3) proved to be effective, where each bar contained enough points to reliably illustrate the asymmetry.

As for the graph of residues x adjusted values (upper right side of Figure 3), it was found that the residues were randomly distributed on both sides along line 0, with no recognized patterns in the points.

However, in a detailed analysis, it was found that 22 points had large residues and were not ideally adjusted, which are marked in red in the graph in Figure 4, which possibly are given due to the delay in the collection of bunches, without significant losses for the explanation of the model.

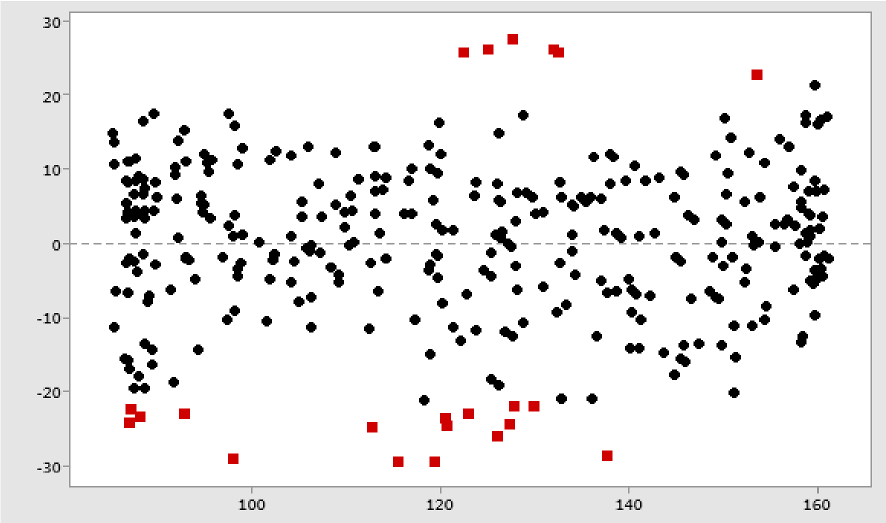


Figure 4: Graph of Adjusted Values x Waste. Source: Authors.

Finally, the graph of residues x order of collection (lower right side of Figure 3), indicates that the residues have satisfactory independence from each other, by presenting themselves randomly around the central line.

With a significance level of 5%, i.e. α=0.05 and t value (tα/2) of 1.97, the confidence and prediction intervals were respectively ± 4.88 and ± 21.30, and the results presented in the application are related to the prediction.

3.3 Mobiles Application

The mobile application developed on the MIT App Inventor 2 platform, was developed with 6 screens for use, where:

i) Screen 1: Home screen of the application, as shown in Figure 5 (a).

ii) Screen 2: The second screen was used - together with the TinyDB database feature - to store the bagging date, entered by the user, as shown in Figures 5 (b) and (c), and at the bottom the user has the button to calculate the prediction of gestation and harvest of bananas bunches. For that, the location sensor of the mobile device must be connected.

iii) Screen 3: The third screen shows the results calculated from the predicted lower limit of gestation and harvest, the predicted values of gestation and harvest and also the predicted upper limit of gestation and harvest of banana bunches. For that, the TinyDB database resources were used in order to use the bagging date information from the previous screen, in addition to using the location sensor to use the latitude data to calculate the photoperiod; and also the DateTools extension that enables to add the gestation values to the bagging date, to present the results, as shown in Figure 5 (d).

At the bottom, the user has the possibility to return to the second screen and perform a new calculation or check the additional information of the application, as shown in Figure 5 (e).

The application was tested on devices with Android operating system version 9, and presented excellent functioning, as shown in Figure 5 with a print of the aforementioned screens.

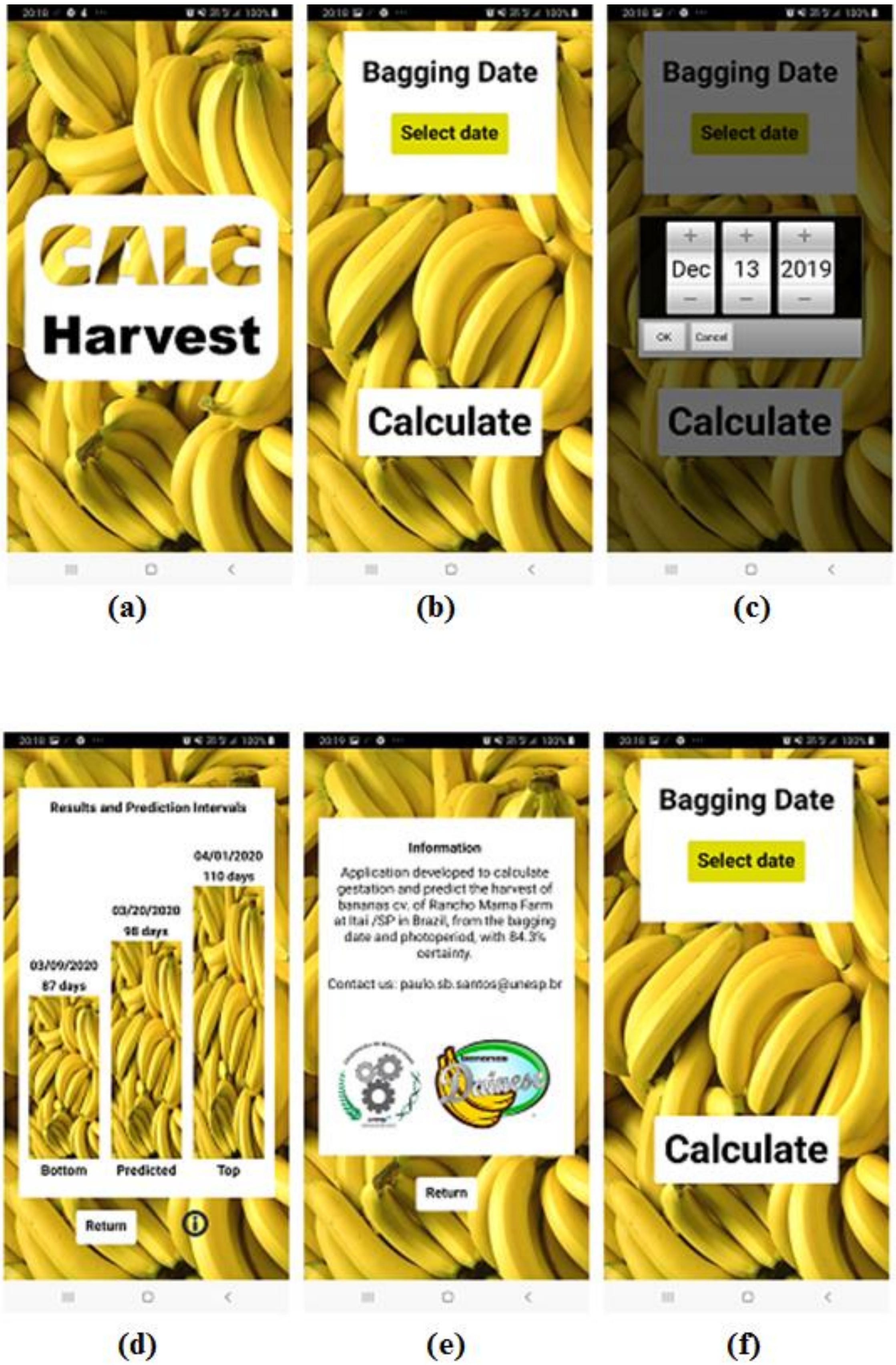


Figure 6: Banana Calc application screens. Source: Authors.

4. Conclusion

The mathematical model proposed in this article obtained a high R2 (84.3%) showing, in percentage, the variation explained by the model and its effectiveness in predicting responses for future observations. The variations that orbit around the exact prediction may occur due to seasonal climatic variations that have occurred over the observed years, or also due to other climatic characteristics not evaluated in this study, such as light intensity, direction and intensity of the winds, atmospheric pressure, individual characteristics of the plants, aging of the banana plantation, the appearance of pests and diseases or the use of pesticides that may delay or advance the fruit harvest, among others.

Another important factor to be considered is the method used to determine the bagging and harvest of the fruits, being in both subjective episodes. As it is a climacteric fruit, which ripens even after harvest, the criteria used in Brazil to predict the time of harvest are empirical and they are based on some morphological aspects such as the disappearance of the corners and angles of the surface of the fruits or on the measurement of the caliber of a fruit from the central bunch, the physiological degree regarding to fruit maturation related to fruit color or in the distinction of fruit by age through markings in the banana plant, as performed in this study.

Taking these criteria into account, some opportunities may open, forcing the producer to harvest the fruits before the ideal point and accelerating their ripening in cold chambers with the addition of ethylene, for example.

In a complementary study using the modeling of artificial neural networks to evaluate banana gestation data, the authors verified that this model presented unprecedented results, with a low error in the average gestation time of the bunch, thus becoming a tool for producers to manage their production. This complementary study obtained a good performance in the training process (Wi weights all adjusted) with an error (MSE) of 0.00397 and an R value of 0.8998, resulting in a strongly positive linear correlation (Souza et al., 2019).

The 4.0 technologies are tools that try to solve some issues and difficulties of adjustments found, and provide the persons improvements in their daily life, becoming something indispensable as new needs arise and, consequently, the search for new techniques to supply them. Having a method for predicting banana gestation time in a less subjective and effective way, in terms of errors and inaccuracies, has been accessible and necessary since the advent of IoT.

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Appendix

Appendix 1. Banana gestation, harvest and meteorological data.

No.	**Gestation (days)**	**Bagging date**	**Harvest Date**	**Temperature (ºC)**	**Precipitation (mm)**	**Humidity (%)**	**Photoperiod (h)**
1	96	03/01/2011	09/04/2011	22,7	9,3	83	13,562
2	92	10/01/2011	12/04/2011	23,4	13,5	81	13,502
3	91	17/01/2011	18/04/2011	22,9	18,9	84	13,421
4	114	24/01/2011	18/05/2011	24,8	0,6	72	13,32
5	99	01/02/2011	11/05/2011	22,8	21,7	82	13,199
6	126	07/02/2011	13/06/2011	23,8	5,5	78	13,06
7	118	14/02/2011	12/06/2011	22,6	12,3	80	12,905
8	132	21/02/2011	03/07/2011	23,6	5,1	77	12,736
9	130	01/03/2011	09/07/2011	19,2	0,5	88	12,555
10	134	07/03/2011	19/07/2011	21,3	1,5	84	12,365
11	130	14/03/2011	22/07/2011	21,1	0,3	81	12,17
12	153	21/03/2011	21/08/2011	22,5	0,1	78	11,972
13	154	28/03/2011	29/08/2011	21,3	0,03	85	11,774
14	164	04/04/2011	15/09/2011	20,5	0	77	11,58
15	156	11/04/2011	14/09/2011	21,6	0	80	11,392
16	167	18/04/2011	02/10/2011	22,8	0	71	11,215
17	163	25/04/2011	05/10/2011	18,3	0	82	11,049
18	156	02/05/2011	05/10/2011	18,1	0	73	10,899
19	163	09/05/2011	19/10/2011	18,7	0	80	10,765
20	155	16/05/2011	18/10/2011	15,6	0	76	10,649
21	158	23/05/2011	28/10/2011	16,3	0	71	10,553
22	131	01/06/2011	10/10/2011	15	0	70	10,479
23	142	06/06/2011	26/10/2011	13,9	0,7	78	10,425
24	127	13/06/2011	18/10/2011	16,5	0,1	69	10,394
25	127	20/06/2011	25/10/2011	18,4	0	76	10,385
26	109	27/06/2011	14/10/2011	15,2	0	69,4	10,399
27	143	04/07/2011	24/11/2011	14	0	73	10,435
28	139	11/07/2011	27/11/2011	20,5	0	53	10,493

29	177	18/07/2011	11/01/2012	18,2	0,3	76	10,572
30	135	25/07/2011	07/12/2011	18,5	0	76	10,672
31	146	01/08/2011	25/12/2011	14,8	0	68	10,792
32	141	08/08/2011	27/12/2011	19,5	0	67	10,929
33	132	15/08/2011	25/12/2011	18,5	0,5	67	11,083
34	110	22/08/2011	10/12/2011	18,4	0	67	11,252
35	132	29/08/2011	08/01/2012	17,8	0	72	11,432
36	129	05/09/2011	12/01/2012	20,3	0	62	11,621
37	155	12/09/2011	14/02/2012	18	0	69	11,816
38	120	19/09/2011	17/01/2012	19,1	0,4	66	12,014
39	112	26/09/2011	16/01/2012	20,9	0,7	58	12,212
40	114	03/10/2011	25/01/2012	20,9	3,8	71	12,407
41	109	10/10/2011	27/01/2012	20,3	16,8	88	12,595
42	97	17/10/2011	22/01/2012	17,8	0,2	70	12,773
43	94	24/10/2011	26/01/2012	21	6,3	71	12,939
44	115	01/11/2011	24/02/2012	17,7	0	69	13,091
45	101	07/11/2011	16/02/2012	22,3	2,6	68	13,226
46	102	14/11/2011	24/02/2012	17,8	4,1	78	13,343
47	107	21/11/2011	07/03/2012	22,1	2,8	66	13,44
48	99	28/11/2011	06/03/2012	21,2	0,6	74	13,517
49	95	05/12/2011	09/03/2012	21,5	12,5	79	13,572
50	94	12/12/2011	15/03/2012	23,3	2,5	60	13,604
51	95	19/12/2011	23/03/2012	24,8	2,8	58	13,615
52	95	26/12/2011	30/03/2012	21,5	3,8	76	13,603
53	96	02/01/2012	07/04/2012	22,3	10,4	72	13,562
54	92	09/01/2012	10/04/2012	20,8	2,4	81	13,502
55	91	16/01/2012	16/04/2012	21,2	13,2	84	13,421
56	114	23/01/2012	16/05/2012	20,5	14,9	82	13,32
57	99	30/01/2012	08/05/2012	24,1	0	55	13,199
58	126	06/02/2012	11/06/2012	24,9	1,2	65	13,06
59	118	13/02/2012	10/06/2012	22,5	14,6	79	12,905
60	132	20/02/2012	01/07/2012	22,8	9,7	80	12,736
61	130	27/02/2012	06/07/2012	24,5	4,4	72	12,555
62	134	05/03/2012	17/07/2012	22,9	0,8	70	12,365
63	130	12/03/2012	20/07/2012	22,1	3,3	75	12,17
64	153	19/03/2012	19/08/2012	22	0	73	11,972
65	154	26/03/2012	27/08/2012	20,9	1,4	77	11,774
66	163	02/04/2012	12/09/2012	22,4	1,7	74	11,58
67	157	09/04/2012	13/09/2012	21,6	3	74	11,392

68	168	16/04/2012	01/10/2012	19,8	0	80	11,215
69	158	23/04/2012	28/09/2012	19,4	6,5	84	11,049
70	160	30/04/2012	07/10/2012	14,9	5,5	81,5	10,899
71	159	04/05/2012	10/10/2012	18,7	3,2	78	10,765
72	159	14/05/2012	20/10/2012	16,1	0,1	80	10,649
73	153	21/05/2012	21/10/2012	17,4	3,6	81	10,553
74	150	28/05/2012	25/10/2012	18,8	1,6	84	10,479
75	142	04/06/2012	24/10/2012	15,9	10,3	92	10,425
76	132	11/06/2012	21/10/2012	17	0,4	86	10,394
77	135	18/06/2012	31/10/2012	16,4	26,9	88	10,385
78	140	25/06/2012	12/11/2012	17,6	0,05	73,4	10,399
79	150	02/07/2012	29/11/2012	18	5,9	72	10,435
80	141	09/07/2012	27/11/2012	14,4	0,8	72	10,493
81	158	16/07/2012	21/12/2012	13,8	0,3	76	10,572
82	136	23/07/2012	06/12/2012	17,4	0	61	10,672
83	128	30/07/2012	05/12/2012	18,2	0	68	10,792
84	127	06/08/2012	11/12/2012	18,4	0	64	10,929
85	121	13/08/2012	12/12/2012	20	0	61	11,083
86	109	20/08/2012	07/12/2012	20,5	0	54	11,252
87	118	27/08/2012	23/12/2012	17,1	0,1	69	11,432
88	115	03/09/2012	27/12/2012	22	0	54	11,621
89	125	10/09/2012	13/01/2013	22,6	0	64	11,816
90	115	17/09/2012	10/01/2013	20,9	10,6	70	12,014
91	110	24/09/2012	12/01/2013	16,3	0,4	71	12,212
92	104	01/10/2012	13/01/2013	23,6	0,1	60	12,407
93	105	08/10/2012	21/01/2013	20,1	4,7	72	12,595
94	100	15/10/2012	23/01/2013	20,3	1,4	71	12,773
95	96	22/10/2012	26/01/2013	23,8	6,9	76	12,939
96	105	29/10/2012	11/02/2013	23,1	1,9	70,5	13,091
97	99	05/11/2012	12/02/2013	22,3	5,3	77	13,226
98	98	12/11/2012	18/02/2013	19,3	0,1	74	13,343
99	98	19/11/2012	25/02/2013	23	0,9	65	13,44
100	92	26/11/2012	26/02/2013	22,7	0	69,6	13,517
101	87	03/12/2012	28/02/2013	25	11,9	73	13,572
102	85	10/12/2012	05/03/2013	23,4	13,7	82	13,604
103	85	17/12/2012	12/03/2013	23,9	3,5	77	13,615
104	80	24/12/2012	14/03/2013	23,7	7,4	78	13,603
105	96	02/01/2013	08/04/2013	22,5	7,9	81	13,562
106	92	09/01/2013	11/04/2013	20,3	10,7	84	13,502

107	91	16/01/2013	17/04/2013	21,12	17,6	78	13,421
108	114	23/01/2013	17/05/2013	22,2	1,6	79	13,32
109	99	30/01/2013	09/05/2013	22	23,3	83,7	13,199
110	126	06/02/2013	12/06/2013	21,3	6,7	84	13,06
111	118	13/02/2013	11/06/2013	24,3	2,5	74	12,905
112	132	20/02/2013	02/07/2013	23,2	10,5	77	12,736
113	130	27/02/2013	07/07/2013	20	3,8	72,8	12,555
114	134	05/03/2013	17/07/2013	23,8	19,4	80	12,365
115	130	12/03/2013	20/07/2013	20,7	7,3	88	12,17
116	153	19/03/2013	19/08/2013	20,1	1,7	86	11,972
117	154	26/03/2013	27/08/2013	20,6	6,2	80,4	11,774
118	163	02/04/2013	12/09/2013	20,9	0,1	83	11,58
119	157	09/04/2013	13/09/2013	20,1	0	72	11,392
120	168	16/04/2013	01/10/2013	22,2	0	64,1	11,215
121	158	23/04/2013	28/09/2013	20,2	0	63	11,049
122	166	29/04/2013	12/10/2013	17,8	0	60,5	10,899
123	168	06/05/2013	20/10/2013	20	0	49,1	10,765
124	170	13/05/2013	30/10/2013	20	0,3	74	10,649
125	160	20/05/2013	26/10/2013	19,7	0,7	75	10,553
126	157	27/05/2013	30/10/2013	15,6	3,3	75,2	10,479
127	147	03/06/2013	27/10/2013	17	1	79	10,425
128	150	10/06/2013	06/11/2013	17,1	5,1	87	10,394
129	144	17/06/2013	08/11/2013	17,2	3,5	84	10,385
130	140	24/06/2013	11/11/2013	17,3	6,6	90	10,399
131	132	01/07/2013	10/11/2013	15,3	8,4	98	10,435
132	150	02/07/2013	29/11/2013	17,5	0,7	78	10,493
133	141	09/07/2013	27/11/2013	17,1	0	77	10,572
134	158	16/07/2013	21/12/2013	17,7	6	81	10,672
135	136	23/07/2013	06/12/2013	15,3	0,3	66,8	10,792
136	155	05/08/2013	06/01/2014	18,6	0	64	10,929
137	151	12/08/2013	10/01/2014	15,7	0	69	11,083
138	148	19/08/2013	13/01/2014	20	0	60	11,252
139	136	26/08/2013	09/01/2014	16,4	0,2	61,8	11,432
140	132	02/09/2013	11/01/2014	19,2	0,5	69	11,621
141	127	09/09/2013	13/01/2014	22,7	0	45	11,816
142	121	16/09/2013	15/01/2014	22,1	4,2	76	12,014
143	117	23/09/2013	17/01/2014	20,7	2,9	77	12,212
144	115	30/09/2013	23/01/2014	20,5	8,6	82,3	12,407
145	119	07/10/2013	02/02/2014	21,3	0	62	12,595

146	101	14/10/2013	28/01/2014	22,3	3,9	70	12,773
147	100	21/10/2013	28/01/2014	20,4	3	65	12,939
148	99	28/10/2013	03/02/2014	21,8	0	63,4	13,091
149	100	04/11/2013	11/02/2014	22	6,7	68	13,226
150	93	11/11/2013	12/02/2014	20	0,9	61	13,343
151	87	18/11/2013	12/02/2014	21	10,1	76	13,44
152	84	25/11/2013	16/02/2014	21,5	1,8	68,6	13,517
153	75	02/12/2013	14/02/2014	22,5	3,1	64	13,572
154	89	09/12/2013	07/03/2014	22,4	2,3	69	13,604
155	70	16/12/2013	23/02/2014	21,3	0	62	13,615
156	71	23/12/2013	03/03/2014	25,3	0,1	69	13,603
157	90	30/12/2013	29/03/2014	24,1	2,2	77,7	13,584
158	79	01/01/2014	21/03/2014	21,8	1,7	73	13,562
159	81	06/01/2014	28/03/2014	22,2	1,9	61	13,502
160	91	13/01/2014	14/04/2014	21,2	5,5	70	13,421
161	95	20/01/2014	25/04/2014	22,5	0,8	62	13,32
162	102	27/01/2014	09/05/2014	23,2	3,5	51,1	13,199
163	107	03/02/2014	21/05/2014	23,5	0,4	44	13,06
164	112	10/02/2014	02/06/2014	23,7	3,5	69	12,905
165	115	17/02/2014	12/06/2014	23,7	0,7	66	12,736
166	125	24/02/2014	29/06/2014	21,6	6,8	73,4	12,555
167	131	03/03/2014	12/07/2014	19,3	5,4	75	12,365
168	139	10/03/2014	27/07/2014	21,9	1,2	69	12,17
169	149	17/03/2014	13/08/2014	20,8	6,4	73	11,972
170	144	24/03/2014	15/08/2014	22,6	0	72	11,774
171	160	31/03/2014	07/09/2014	21,6	9	74,3	11,58
172	159	07/04/2014	13/09/2014	20,8	5,6	74	11,392
173	157	21/04/2014	25/09/2014	22,5	0,7	74	11,215
174	158	28/04/2014	03/10/2014	15,5	0	64,5	11,049
175	160	05/05/2014	12/10/2014	18,6	0	57	10,899
176	162	05/05/2014	14/10/2014	19,8	0	65	10,765
177	165	12/05/2014	24/10/2014	20,4	0	65	10,649
178	165	19/05/2014	31/10/2014	17,1	5,3	77	10,553
179	165	26/05/2014	07/11/2014	16,5	0,7	74,7	10,479
180	160	02/06/2014	09/11/2014	15	2,3	57	10,425
181	150	09/06/2014	06/11/2014	15,8	0	68	10,394
182	152	16/06/2014	15/11/2014	16,1	0	74	10,385
183	148	23/06/2014	18/11/2014	15,9	0	61	10,399
184	148	30/06/2014	25/11/2014	16,3	0	45,7	10,435

185	142	07/07/2014	26/11/2014	15,2	0,6	73	10,493
186	139	14/07/2014	30/11/2014	17,7	0	60	10,572
187	134	21/07/2014	02/12/2014	17	1,4	62	10,672
188	127	28/07/2014	02/12/2014	14,6	0	60,4	10,792
189	125	04/08/2014	07/12/2014	17,7	0	53,9	10,929
190	121	11/08/2014	10/12/2014	15	0,3	56	11,083
191	116	18/08/2014	12/12/2014	19,6	0,6	50	11,252
192	122	25/08/2014	25/12/2014	18,3	2,8	62	11,432
193	115	02/08/2014	25/11/2014	18,9	4,8	70	11,621
194	107	08/09/2014	24/12/2014	22,9	0	51	11,816
195	112	15/09/2014	05/01/2015	19,7	3,5	73	12,014
196	111	22/09/2014	11/01/2015	19,3	10,4	78	12,212
197	106	29/09/2014	13/01/2015	18,6	1,05	71,7	12,407
198	105	06/10/2014	19/01/2015	23,9	0	47	12,595
199	115	13/10/2014	05/02/2015	25,8	0	56	12,773
200	112	20/10/2014	09/02/2015	20,3	3,2	75	12,939
201	107	27/10/2014	11/02/2015	22,1	0,3	59,6	13,091
202	107	03/11/2014	18/02/2015	22,4	3,6	77	13,226
203	106	10/11/2014	24/02/2015	20,7	0,3	67	13,343
204	96	17/11/2014	21/02/2015	21,1	5,2	72	13,44
205	97	24/11/2014	01/03/2015	21,8	6,9	79,5	13,517
206	96	01/12/2014	07/03/2015	22,3	0,5	71	13,572
207	96	08/12/2014	14/03/2015	22,2	14,1	82	13,604
208	98	15/12/2014	23/03/2015	22,8	4,2	70	13,615
209	98	22/12/2014	30/03/2015	22,9	12,8	79	13,603
210	91	29/12/2014	30/03/2015	24,1	2,2	76,1	13,584
211	100	05/01/2015	15/04/2015	25,4	6,7	67	13,562
212	105	12/01/2015	27/04/2015	27,3	0	60	13,502
213	108	19/01/2015	07/05/2015	24,6	4,9	67	13,421
214	99	26/01/2015	05/05/2015	22,2	13	81	13,32
215	106	02/02/2015	19/05/2015	22,2	8	77	13,199
216	110	09/02/2015	30/05/2015	23	14,5	83	13,06
217	125	16/02/2015	21/06/2015	22,3	15,5	84	12,905
218	127	23/02/2015	30/06/2015	23,1	1,6	74,3	12,736
219	139	02/03/2015	19/07/2015	22,9	11,8	79	12,555
220	135	09/03/2015	22/07/2015	21,6	5,7	84	12,365
221	143	16/03/2015	06/08/2015	21,2	4	83	12,17
222	142	23/03/2015	12/08/2015	22	3,1	77	11,972
223	149	30/03/2015	26/08/2015	21,8	2,6	77	11,774

224	160	06/04/2015	13/09/2015	19,8	0,4	76	11,58
225	159	13/04/2015	19/09/2015	21,4	4,1	79	11,392
226	154	20/04/2015	21/09/2015	21,2	9,6	81	11,215
227	146	27/04/2015	20/09/2015	18,8	0	74,7	11,049
228	154	04/05/2015	05/10/2015	18,2	0,5	79	10,899
229	151	11/05/2015	09/10/2015	16,8	3,4	83	10,765
230	146	18/05/2015	11/10/2015	19,2	10,3	81	10,649
231	136	25/05/2015	08/10/2015	17,8	0	85	10,553
232	140	01/06/2015	19/10/2015	17,9	3,7	80	10,479
233	134	08/06/2015	20/10/2015	20,2	2,1	68	10,425
234	129	15/06/2015	22/10/2015	16,1	1,8	81	10,394
235	126	22/06/2015	26/10/2015	16,2	0,8	73	10,385
236	124	29/06/2015	31/10/2015	16	3,6	83	10,399
237	115	06/07/2015	29/10/2015	16,7	0	86	10,435
238	112	13/07/2015	02/11/2015	20	0,7	72	10,493
239	108	20/07/2015	05/11/2015	16,8	0,1	80	10,572
240	103	27/07/2015	07/11/2015	18,2	0	56,2	10,672
241	106	03/08/2015	17/11/2015	21,7	0	47	10,792
242	107	10/08/2015	25/11/2015	21	0	55	10,929
243	100	17/08/2015	25/11/2015	19,2	0	62	11,083
244	97	24/08/2015	29/11/2015	18,8	4,2	71	11,252
245	96	01/09/2015	06/12/2015	18,5	0	73	11,432
246	97	07/09/2015	13/12/2015	17,4	17,3	85	11,621
247	86	14/09/2015	09/12/2015	23,7	0,3	59	11,816
248	101	21/09/2015	31/12/2015	25,2	3,1	52	12,014
249	105	28/09/2015	11/01/2016	20,7	4,2	82	12,212
250	105	05/10/2015	18/01/2016	21,7	3,7	75	12,407
251	97	12/10/2015	17/01/2016	22,6	0,8	69	12,595
252	91	19/10/2015	18/01/2016	22,2	0,5	72	12,773
253	89	26/10/2015	23/01/2016	21,5	8	81	12,939
254	87	02/11/2015	28/01/2016	20,2	16,2	88	13,091
255	80	09/11/2015	28/01/2016	24	15,7	76	13,226
256	73	16/11/2015	28/01/2016	22,2	3,7	80	13,343
257	73	23/11/2015	04/02/2016	21,5	19,3	84	13,44
258	68	30/11/2015	06/02/2016	21,9	3,3	80,8	13,517
259	65	07/12/2015	10/02/2016	22,4	5,6	80	13,572
260	65	14/12/2015	17/02/2016	23,5	6,9	77	13,604
261	84	21/12/2015	14/03/2016	21,1	13,6	79	13,615
262	71	28/12/2015	08/03/2016	22,2	12,8	87,7	13,603

263	74	04/01/2016	18/03/2016	23,5	3	77	13,562
264	69	11/01/2016	20/03/2016	21,8	23,3	85	13,502
265	70	18/01/2016	28/03/2016	21,5	0	71	13,421
266	69	25/01/2016	03/04/2016	23,9	4,5	77	13,32
267	95	01/02/2016	06/05/2016	24,9	2,4	71	13,199
268	88	08/02/2016	06/05/2016	24,9	0,7	70	13,06
269	90	15/02/2016	15/05/2016	24,3	11,9	79	12,905
270	100	22/02/2016	01/06/2016	22,4	8,9	85	12,736
271	123	29/02/2016	01/07/2016	21,4	5	81,6	12,555
272	131	07/03/2016	16/07/2016	23,1	2,7	77	12,365
273	143	14/03/2016	04/08/2016	22,9	3,4	76	12,17
274	136	21/03/2016	04/08/2016	22,6	4,2	80	11,972
275	142	28/03/2016	17/08/2016	24,4	0,2	72	11,774
276	145	04/04/2016	27/08/2016	25	0	66	11,58
277	150	11/04/2016	08/09/2016	25	1,6	66	11,392
278	155	18/04/2016	20/09/2016	25,1	0	64	11,215
279	161	25/04/2016	03/10/2016	16,4	3,6	57	11,049
280	164	02/05/2016	13/10/2016	18,3	0,2	72,9	10,899
281	168	09/05/2016	24/10/2016	18	1,3	83	10,765
282	158	16/05/2016	21/10/2016	17,7	12,1	87	10,649
283	147	23/05/2016	17/10/2016	15,6	5,4	83	10,553
284	147	30/05/2016	24/10/2016	17,6	14	91,4	10,479
285	142	06/06/2016	26/10/2016	12,9	9	74	10,425
286	151	13/06/2016	11/11/2016	15,5	0	71	10,394
287	142	20/06/2016	09/11/2016	14,3	0	83	10,385
288	131	27/06/2016	05/11/2016	18,3	0	64,6	10,399
289	132	04/07/2016	13/11/2016	17,4	0	61	10,435
290	135	11/07/2016	23/11/2016	19,6	1,8	60	10,493
291	125	18/07/2016	20/11/2016	13,4	0	76	10,572
292	122	25/07/2016	24/11/2016	17,7	0	68	10,672
293	118	01/08/2016	27/11/2016	19,2	0	64	10,792
294	107	08/08/2016	23/11/2016	15,9	0	69	10,929
295	112	15/08/2016	05/12/2016	19,1	7,3	73	11,083
296	110	22/08/2016	10/12/2016	17,9	0,1	62	11,252
297	115	29/08/2016	22/12/2016	18,5	6,4	77,6	11,432
298	104	05/09/2016	18/12/2016	17,1	2,8	75	11,621
299	120	12/09/2016	10/01/2017	20,9	0	55	11,816
300	122	19/09/2016	19/01/2017	17,8	0,7	70	12,014
301	114	26/09/2016	18/01/2017	17,7	0	64,1	12,212

302	121	03/10/2016	01/02/2017	17,7	5,1	73	12,407
303	111	10/10/2016	29/01/2017	21,1	8,8	76	12,595
304	113	17/10/2016	07/02/2017	23,8	1,4	70	12,773
305	109	24/10/2016	10/02/2017	19,5	2,9	76	12,939
306	106	31/10/2016	14/02/2017	20,5	5,5	76,4	13,091
307	100	07/11/2016	15/02/2017	21,7	2,1	74	13,226
308	101	14/11/2016	23/02/2017	20,2	1,6	71	13,343
309	94	21/11/2016	23/02/2017	22,9	0,9	69	13,44
310	92	28/11/2016	28/02/2017	21,4	5,3	77,1	13,517
311	97	05/12/2016	12/03/2017	22,9	11,2	76	13,572
312	91	12/12/2016	13/03/2017	21,7	0,3	76	13,604
313	91	19/12/2016	20/03/2017	23,1	4,6	72	13,615
314	92	26/12/2016	28/03/2017	24,5	7,3	72,3	13,603
315	99	02/01/2017	11/04/2017	24	1,9	74	13,562
316	93	09/01/2017	12/04/2017	23,8	6	77	13,502
317	104	16/01/2017	30/04/2017	21,4	15,7	86	13,421
318	102	23/01/2017	05/05/2017	21,9	17,8	84	13,32
319	116	30/01/2017	26/05/2017	22,6	13,4	80,4	13,199
320	117	06/02/2017	03/06/2017	24,2	1,9	72	13,06
321	129	13/02/2017	22/06/2017	25,7	1,2	66	12,905
322	127	20/02/2017	27/06/2017	23,8	3,4	72	12,736
323	141	27/02/2017	18/07/2017	23,2	3,4	81,1	12,555
324	151	06/03/2017	04/08/2017	24,5	9,5	75	12,365
325	155	13/03/2017	15/08/2017	21,8	8,1	81	12,17
326	167	20/03/2017	03/09/2017	21,3	0	72	11,972
327	176	27/03/2017	19/09/2017	19,7	0	73	11,774
328	176	03/04/2017	26/09/2017	22	8,9	76	11,58
329	176	10/04/2017	03/10/2017	21,6	0	75	11,392
330	177	17/04/2017	11/10/2017	19,2	11,8	79	11,215
331	181	24/04/2017	22/10/2017	18,5	2,7	80	11,049
332	178	01/05/2017	26/10/2017	18,6	4,2	81	10,899
333	175	08/05/2017	30/10/2017	19,2	0,5	75	10,765
334	170	15/05/2017	01/11/2017	17,7	14,5	84	10,649
335	165	22/05/2017	03/11/2017	18,6	4,7	79,6	10,553
336	161	05/06/2017	13/11/2017	18,6	12	78	10,479
337	155	12/06/2017	14/11/2017	16,4	7,6	78	10,425
338	150	19/06/2017	16/11/2017	17	0	77	10,394
339	146	26/06/2017	19/11/2017	16,9	0	71,7	10,385
340	139	03/07/2017	19/11/2017	15,1	0,1	67	10,399

341	133	10/07/2017	20/11/2017	18,5	0	61	10,435
342	135	17/07/2017	29/11/2017	15,3	0	69	10,493
343	131	24/07/2017	02/12/2017	18,7	0	56	10,572
344	124	31/07/2017	02/12/2017	16,2	0	64,5	10,672
345	134	07/08/2017	19/12/2017	19,7	0	60	10,792
346	130	14/08/2017	22/12/2017	16,1	0	87	10,929
347	123	21/08/2017	22/12/2017	17,7	5,3	70	11,083
348	116	28/08/2017	22/12/2017	19,6	0	65,1	11,252
349	122	04/09/2017	04/01/2018	22,4	0	44	11,432
350	121	11/09/2017	10/01/2018	24,7	0	41	11,621
351	123	18/09/2017	19/01/2018	22,6	0	56	11,816
352	120	25/09/2017	23/01/2018	20,2	2,7	70,4	12,014
353	115	02/10/2017	25/01/2018	20,4	13,2	68	12,212
354	111	09/10/2017	28/01/2018	24,4	7,1	65	12,407
355	105	16/10/2017	29/01/2018	21,4	1,6	71	12,595
356	101	23/10/2017	01/02/2018	19	7,7	84	12,773
357	100	30/10/2017	07/02/2018	19	26,6	80	12,939
358	95	06/11/2017	09/02/2018	20	1,7	77	13,091
359	89	13/11/2017	10/02/2018	22,6	2	63	13,226
360	85	20/11/2017	13/02/2018	21,6	7	74	13,343
361	82	27/11/2017	17/02/2018	20,9	9,4	76,3	13,44
362	75	04/12/2017	17/02/2018	23,4	0	70	13,517
363	70	11/12/2017	19/02/2018	23,8	0,7	64	13,572
364	63	18/12/2017	19/02/2018	22,2	17,1	83	13,604

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