IICA

ADOPTION OF MINI-SETT TECHNOLOGY IN JAMAICA

JANUARY 1995

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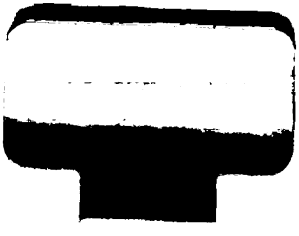

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ABSTRACT

Adoption of mini-sett technology in Jamaica

The introduction of a new agricultural practice or technological package and its adoption by small farmers is a complex process.

After one year of exposing the mini-sett technology on farmers' holdings, 191 farmers were interviewed to appraise farmers' opinions of the components in the mini-sett production package. Only 86 farmers who had harvested from their demonstration plots at the time of the survey, answered questions on acceptability of the technological innovation. Seventy-seven embraced some aspects of the method and nine did not. The most commonly used component was the use of small setts, and the most commonly rejected was the use of modified stakes and closer planting. It appeared that the farmers' decision to adopt mini-sett technology practices was influenced by the yield obtained from their plots.

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INTRODUCTION

Yam is the most important non-traditional agricultural crop grown in Jamaica, accounting for 58% of the foreign exchange earned in that sector. In 1992, 10,431 tonnes of yam valued at US$10.1 million were exported (Planning Institute of Jamaica, 1992).

Given the recent changes in the world markets, towards increased liberalization and competition, the issue of competitiveness of Jamaican yams becomes crucial as it must compete with supplies from other countries; principally, Costa Rica and Brazil, which are capable of producing the crop at lower prices. Whereas the main varieties produced in these countries are Dioscorea alata (sweet yam) and D. rotundata (negro yam), Jamaica has become the main exporter of D. cayenensis (yellow yam) to Canada, the United Kingdom and the United States. To ensure and enhance this market share, the price and quality of Jamaican yams must remain competitive. It is expected that with the introduction of mini-sett techniques to improve the production practices of yam producers, Jamaican yams would increasingly become more competitive.

The mini-sett system of yam production was developed in Nigeria. A mini-sett has been defined as a sett which is less than one quarter of the normal planting piece (Okoli, Igbokwe, Ene and Nwokoye, 1982). It involves the cutting of mother tubers into small setts (25 g), each with a piece of skin intact. To prevent rotting, the setts are treated with an insecticide/fungicide dip before setting in the nursery to sprout (Iwueke, Mbata and Okereke, 1983). This system of production was introduced to Jamaica in 1985 to reduce some of the problems associated with traditional production. Among the problems referred to are:

a) The use of large setts for planting which require large hills and stakes, thus contributing to increasingly high production costs.

b) The production of irregularly shaped yellow yam tubers render them unattractive to purchasers, thus limiting the expansion of the market.

c) The necessity to cut the yam tubers to facilitate packaging increases the number of open cut surfaces. This requires the use of post-harvest chemical treatment prior to export.

In addition, the traditional system seems to contribute significantly to the degradation of the environment through first, the channels formed between individual hills which serve to concentrate run off water and aggravate soil erosion on hillsides during heavy rainfall (Payne, 1976); second, the removal of trees from the hillsides to be used as stakes ultimately affects the watersheds by contributing to the problem of de-forestation. This problem is especially important as the main yam growing areas are on hillsides.

The National Yam Export Development Project (NYEDP), which was funded jointly by the United States Agency for International Development (USAID), the Rural Agricultural and Development Authority (RADA) and the Inter-American Institute for Cooperation on Agriculture (IICA), promoted the use of mini-sett technology through the establishment of 1,000 on-farm demonstration plots. The project's major objective was to train Extension Officers and farmers with regard to the mini-sett technology. The technological transfer and dissemination of mini-sett technology sought to improve the production and productivity of small yam farmers by promoting a system that is less laborious, more productive and profitable, and environmentally friendlier than the traditional system.

In this survey some of the project's farmers were interviewed to examine the extent to which the mini-sett yam technology had been adopted after the first year.

METHODOLOGY

The Farming Systems Research and Extension (FSR & E) methodology was used to transfer the technology to yam farmers in the parishes of Clarendon, Hanover, Manchester, St. Andrew, St. Ann, St. Catherine, Trelawny. The failure of farmers to adopt new yam technologies in Jamaica has been attributed to the fact that the research was not done under farmers conditions (Payne, 1976).

The farmers involved in this study were randomly selected from a list of participating farmers in the NYEDP. All the farmers in this project were provided with the inputs and extension services required to establish a demonstration plot of 0.025 hectares.

Information on the farmers' background, the performance of the demonstration plots and the level of adoption were collected on 191 farmers. However, when the survey was completed at the end of the first year of extension activity, only 88 farmers had answered the questions related to adoption of the mini-sett technology. The other 103 farmers wanted to see the level of production from their demonstration plots, before deciding to adopt the mini-sett method.

Six components of the mini-sett technological package were introduced. These were:-

- the treating of setts before planting

- the use of smaller setts

- planting on continuous mounds

- eliminating the use of stakes

- the use of plastic mulch for weed control and

- higher density planting.

The number of components adopted by the farmer was differentiated into "most", "some" and "none": i) "most", referring to farmers selecting more than three of the six mini-sett components; ii) "some"; for those adopting one to three components; and iii) "none",

farmers who did not adopt. The survey was intended to determine the factors influencing adoption of the technology. This report relates only to those farmers who had already harvested and answered the questions on adoption.

RESULTS OF THE SURVEY

a) Social aspects of yam farmers

The social characteristics of the yam farmers included in this study were compared with those of yam farmers included in a larger survey carried out by the Ministry of Agriculture (Modified Baseline Survey, 1992) (Table 1). The results indicated that the 86 farmers who answered the questions on adoption have similar social characteristics to those in the Ministry of Agriculture Survey, i.e. Predominantly farmers with primary or no education (65%) and over 50 years old (51%).

b) Social factors which effected adoption

Younger farmers tended to adopt most of the technology while the older farmers adopted some or none (Table 2), thus the younger farmers appeared to be more prone to adopt the new technological package. Similarly, the results suggested that the more educated farmers had a higher level of adoption. All the farmers with tertiary education adopted at least one practice, whereas 81% of the farmers with secondary education and 91% of the farmers with primary education adopted some of the practices (Table 3). There were similar levels of adoption between female and male farmers with 16.6% (one out of six) female and 10% (eight out of 80) males not adopting any of the practices (Table 4).

c) Other factors

i) Level of non-adoption

It was difficult to determine why nine of the farmers did not adopt any of the mini-sett components.

The level of sprouting for the group that did not adopt was similar to the level of sprouting for farmers who adopted the measures (Table 5). Marketing problems did not appear to be more severe for the farmers who did not adopt than for those who adopted. Of the nine farmers who did not adopt, seven had no difficulty in marketing their produce. Low demand and transport were the main marketing problems indicated by the other two farmers who did not adopt any of the components (Table 6).

Of the nine farmers who did not adopt; none considered the new method to be more complicated, less profitable or to yield less than the traditional method. Seven agreed that the new method required less labour and five that it was more profitable (Table 7). All but one farmer claimed to have understood the method well (Table 8). There was a complex matrix of farmers' perception as to the advantages and disadvantages of the new method. Of the farmers who did not adopt, all but two appreciated the ease of use of the new practices and three thought that the new system was profitable (Table 9). One farmer indicated that the produce was more marketable.

Five of the nine farmers who did not adopt the practices could find no disadvantage with the new method. Only one farmer thought the methodology was complex and costly and two considered the methodology risky. Of the nine farmers, one thought the tuber size was a disadvantage and two claimed that the method was risky (Table 10). This suggested that there were other variables to be considered or that the farmers were simply unwilling to adopt any of the technological components of the mini-sett system.

For the farmers who did not adopt, the average yield per demonstration plot was 458 kg. This compared with 728 kg per plot obtained by farmers adopting some of the measures and 1,080 kg by those adopting most measures (Table 11). The maximum yield obtained by farmers who did not adopt was less than 50% of the maximum yield of those who adopted some or most of the components. The results therefore indicated that yield influenced the adoption of the technology.

ii) Adoption of some or most of the components

Despite the fact that 35 farmers encountered some level of rotting of setts in the nursery and 10 did not have adequate water for irrigating the nursery (Table 12), this did not prevent some level of adoption.

As indicated earlier, the problems identified with marketing were similar to those experienced by the farmers who did not adopt. Twenty-one farmers had no difficulty in marketing the crop. Fourteen farmers had difficulties with transporting the produce and eleven farmers reported that the demand was low (Table 6). Of those farmers who adopted some level of the technology five sold their crops directly to consumers; 19 sold only to exporters and 15 sold only to higglers. Two farmers supplied both higglers and exporters (Table 16).

Most of the farmers adopting claimed they understood the technology well (Table 8). Fifty-one farmers who adopted reported that the inputs were available to them (Table 13), but most found the inputs too costly (Table 14). Sixty-eight percent of farmers agreed that the sett size used for traditional production could be made smaller (Table 15).

Of the mini-sett components, the most commonly adopted was the use of the smaller setts (62 farmers) and planting on continuous mounds (40 farmers) (Table 17). The least adopted aspects were the use of closer planting and adjusting the application of stakes (22 farmers each).

The most common reason for adoption of the mini-sett technology concerned yield (63 times) (Table 18) and the most common reason for rejecting a component was lack of understanding (20 times) (Table 19).

d) General findings

At the end of the first year, 77 (90%) of the farmers who had harvested their demonstration plot showed some level of adoption of the technology. Ninety percent of these farmers were willing to plant smaller setts and 62 farmers used smaller setts in the following crop. All the farmers who adopted more than three of the mini-sett practices were willing to reduce the size of the sett however, seven farmers who adopted less than three of the practices thought otherwise (Table 15).

Sixteen percent of farmers had over 90% sprouting; most farmers had between 76-90% sprouting. No farmer had less than 25% sprouting (Table 5).

Forty-six farmers could find no disadvantages with the mini-sett method, 15 considered the tuber size to be a disadvantage and five suggested that the mini-sett system was more risky than traditional methods (Table 10).

Ease of application and reduction in labour were the most frequently reported advantages of mini-sett techniques. Thirty-five farmers cited a combination of these two advantages and an additional 15 farmers reported that the mini-sett system was also more profitable (Table 12). Less frequently, marketability and profitability were reported as advantages of the new technology.

DISCUSSION

From the results, it is questionable why nine farmers did not adopt any of the components since they could not identify any disadvantage of the technology (Table 10). It was noted however that eight of these nine farmers cited advantages of mini-sett technology (Table 9). In general, it seemed that the farmers who found the mini-sett technology easy to apply, less laborious and profitable showed a high level of adoption.

When making decisions to change a production system the farmer is expected to weigh each aspect and develop an index to influence his decision. In some aspects the farmers decision appeared to be subjective, however it seemed that yield was given a high weight on the decision index which resulted in a higher level of adoption among the farmers with higher yields. Few farmers had difficulty marketing the crop, and this combined with the fact that the farmers who obtained the highest yields adopted the technology, strongly supported the view that obtaining an acceptable harvest may have had a considerable influence on the chance of the technology being adopted. The data clearly showed that the most common reason for adoption of the mini-sett technology concerned yield.

Since the plots were planted with the same amount of planting material and there were no significant differences in the percentage sprouting of the farmers who adopted and those which did not adopt, it could be inferred that the plots who produced higher yields produced larger tubers than the plots with low yields. The data also showed that some farmers considered tuber size to be a disadvantage, which may have influenced their decision to plant smaller setts, however, the most frequently adopted component was the use of smaller setts.

According to Hildebrand (1985), the acceptable index for technology adoption is given by

$$\text{Acceptability index} = \frac{C \times A}{100}$$

where C = percentage of farmers who used at least part of the innovation the following year

A = among the farmers using the innovation, the percentage area that the innovation is applied.

When AI is greater than 25 and C is greater than or equal to 50 it can be expected that adoption will follow. Therefore, the minimum area of the yam plots on which farmers need to apply this technology in the following year is:

$$A = \frac{100 \times 25}{90}$$

approximately 30%, in order to sustain adoption. This would seem a realistic area for farmers to continue their observations of the performance of the methodology.

Since the information on adoption related to less than half of the farmers included in the study, the information gleaned from this report should be treated with caution. However, they may serve as an indicator of the adoption of the mini-sett technology until a larger survey can be conducted. Nevertheless, with a 90% level of adoption it can be expected that the technology will be sustainable.

TABLE 1: SOCIAL ASPECTS OF THE YAM FARMERS

Social aspects	Percentage of farmers	
	Current survey	Ministry of Agriculture (1992)
Female	7	10
With primary or no education	65	67
With tertiary education	10	8
Over 50 years old	51	52
With over 25 years farming experience	60	46
Who are full-time farmers	43*	74

* This figure relates to all members of the household.
Source Modified Baseline Survey NYEDP Data Bank, Ministry of Agriculture, 1992.

TABLE 2: AGE OF FARMERS ADOPTING MINI-SETT TECHNOLOGY

Age (Years)	Level of adoption		
	None [1]	Some [2]	Most [3]
Average age	60	54	41

Notes 1] None of the six mini-sett components.
2] 1 to 3 components.
3] 4 to 6 components.

TABLE 3: EDUCATION OF MINI-SETT FARMERS
(BY LEVEL OF ADOPTION)

Education	Level of adoption (Number of farmers)		
	None [1]	Some [2]	Most [3]
Up to Primary	5	46	5
Secondary	4	12	5
Tertiary	0	7	2
Total	9	65	12

Notes 1] None of the six mini-sett components.
2] 1 to 3 components.
3] 4 to 6 components.

TABLE 4: SEX OF FARMERS BY LEVEL OF ADOPTION OF MINI-SETT TECHNOLOGY

Sex of farmer	Level of adoption (Number of farmers)		
	None [1]	Some [2]	Most [3]
Male	8	61	11
Female	1	4	1
Total	9	65	12

Notes 1] None of the six mini-sett components.
2] 1 to 3 components.
3] 4 to 6 components.

TABLE 5: SPROUTING RATE OF SETTS PLANTED
(BY LEVEL OF ADOPTION)

Percentage sprouting of setts in the nursery	Level of adoption (Number of farmers)		
	None [1]	Some [2]	Most [3]
> 90	2	33	8
76 - 90	3	14	1
51 - 75	1	12	1
25 - 50	3	2	2
Delivered setts pre-sprouting	0	4	0
Total	9	61	12

Notes 1] None of the six mini-sett components.
2] 1 to 3 components.
3] 4 to 6 components.

TABLE 6: MARKETING PROBLEMS AMONG MINI-SETT FARMERS
(BY LEVEL OF ADOPTION)

Market problem	Level of adoption (Number of farmers)			
	None 1]	Some 2]	Most 3]	Total
No response	0	27	3	30
No market problem	7	19	2	28
Transportation	0	8	3	11
Low demand for products	1	6	1	8
Post-harvest rot	0	3	0	3
Low demand, low price	0	1	0	1
Low demand, transport	1	1	2	4

Notes 1] None of the six mini-sett components.
2] 1 to 3 components.
3] 4 to 6 components.

TABLE 7: COMPARISON OF MINI-SETT AND TRADITIONAL TECHNOLOGICAL PACKAGES
(BY LEVEL OF ADOPTION)

MINI-SETT compared to the traditional method	Level of adoption (Number of farmers)		
	None 1]	Some 2]	Most 3]
Less labour	4	36	3
Less labour and more profitable	3	14	6
More profitable	2	4	2
Lower yield	0	4	0
Lower yield and less labour	0	2	0
More complex, but less labour and more profitable	0	2	0
Less labour, more costly and more profitable	0	1	0
Less profitable	0	1	1
More complex	0	0	0
More costly	0	0	0

Notes 1] None of the six mini-sett components.
2] 1 to 3 components.
3] 4 to 6 components.

TABLE 8: UNDERSTANDING THE MINI-SETT TECHNOLOGY
(BY LEVEL OF ADOPTION)

Level of Understanding	Level of adoption (Number of farmers)			
	None 1]	Some 2]	Most 3]	Total
Understood well	8	56	12	76
Understood little	1	7	0	8
Did not understand	0	2	0	2
Total	9	65	12	86

Notes 1] None of the six mini-sett components.
2] 1 to 3 components.
3] 4 to 6 components.

TABLE 9: ADVANTAGES OF MINI-SETT TECHNOLOGY
(BY LEVEL OF ADOPTION)

Advantage	Level of adoption (Number of farmers)			
	None [1]	Some [2]	Most [3]	Total
Easy to apply and saves labour	2	30	3	35
Easy to apply, saves labour and profitable	2	10	3	15
Saves labour	0	8	1	9
Profit	0	5	1	6
Easy to apply	2	3	1	6
Marketable	0	3	0	3
Saves labour and more profitable	1	1	0	2
Profitable and marketable	0	1	1	2
Easy to apply, saves labour and marketable	1	4	2	7
Total	8	65	12	85

Notes 1] None of the six mini-sett components.
2] 1 to 3 components.
3] 4 to 6 components.

TABLE 10: DISADVANTAGES OF MINI-SETT TECHNOLOGY
(BY LEVEL OF ADOPTION)

Disadvantages	Level of adoption (Number of farmers)		
	None [1]	Some [2]	Most [3]
None	5	34	7
Tuber size	1	12	2
Costly	0	5	1
Risky	2	2	1
Inputs not available	0	4	0
Low yield	0	3	0
Complex	0	2	0
Costly and complex	1	1	0
Inputs unavailable and technology risky	0	1	0
Technology risky and tuber size small	0	1	0
Total	9	65	12

Notes 1] None of the six mini-sett components.
2] 1 to 3 components.
3] 4 to 6 components.

TABLE 11: YIELD OF DEMONSTRATION PLOTS (KG/PLOT)
(BY LEVEL OF ADOPTION)

Concept	Level of adoption		
	None [1]	Some [2]	Most [3]
Average yield kg	458	728	1,080
Maximum yield kg	1,000	2,750	2,300

Notes 1] None of the six mini-sett components.
2] 1 to 3 components.
3] 4 to 6 components.

TABLE 12: FACTORS AFFECTING SETTS SPROUTING AT THE NURSERY
(BY LEVEL OF ADOPTION)

Factors contributing to the number of setts that sprouted in the nursery (ranked by some)	Number of components adopted (Number of farmers)		
	None[1]	Some[2]	Most[3]
Setts rot in the nursery before sprouting	4	35	0
Lack of water to apply to the nursery	3	9	1
Received setts already sprouted	1	8	0
Other	0	7	1
None	0	3	0
Fluctuation from too much to too little water in the nursery	0	1	0
Poor planting material used to prepare the setts	1	1	0
Total	9	65	12

Notes 1] None of the six mini-sett components.
2] 1 to 3 components.
3] 4 to 6 components.

TABLE 13: AVAILABILITY OF INPUTS
(BY LEVEL OF ADOPTION)

Availability of inputs	Adoption (Number of farmers)			
	None[1]	Some[2]	Most[3]	Total
Inputs available	8	40	11	59
Inputs not available	1	24	1	26
Total	9	64	12	85

Notes 1] None of the six mini-sett components.
2] 1 to 3 components.
3] 4 to 6 components.

TABLE 14: FARMERS REASONS WHY INPUTS ARE NOT AVAILABLE

Reasons	Number of farmers
Too costly	48
Far away	18

TABLE 15: FARMERS WILLING TO PLANT SMALLER SETTS
(BY LEVEL OF ADOPTION)

Response	Level of adoption (Number of farmers)			
	None [1]	Some [2]	Most [3]	Total
Yes	7	57	11	75
No	2	7	0	9

Notes 1] None of the six mini-sett components.
2] 1 to 3 components.
3] 4 to 6 components.

TABLE 16: MARKET OUTLET USED FOR MINI-SETT YAMS
(BY LEVEL OF ADOPTION)

Market outlet	Level of adoption (Number of farmers)			
	None [1]	Some [2]	Most [3]	Total
Exporter	3	14	5	22
Higgler	2	13	2	17
Consumer	0	5	0	5
Consumer and Exporter	0	5	0	5
Used on the farm	3	1	0	4
Higgler and Exporter	1	2	0	3

Notes 1] None of the six mini-sett components.
2] 1 to 3 components.
3] 4 to 6 components.

TABLE 17: COMPONENTS OF THE MINI-SETT TECHNOLOGY ADOPTED

Component	Number of farmers adopting
Smaller sett	62
Continuous mounds	40
Treating setts	33
Mulching	31
Modified stake	22
Closer planting	22

TABLE 18: REASONS FOR ADOPTION OTHER MINI-SETT TECHNOLOGY

Reason for adopting	Number of times
Mini-sett yield	63
Other	23
No reason	17
Disease control	12
Less labour	10
Density	9
Less cost	7
Soil erosion	3

Others include: weed control, to produce planting material

TABLE 19: REASONS FOR NOT ADOPTING THE MINI-SETT TECHNOLOGY

Reason for not adopting	Number of times
Did not understand	20
Low yield	17
More labour	9
Too costly	8
Need stakes	3
Too risky	1

Others include: don't know, depends on soil type, not familiar with it, continuous mounds are not practical, hard to break traditional method

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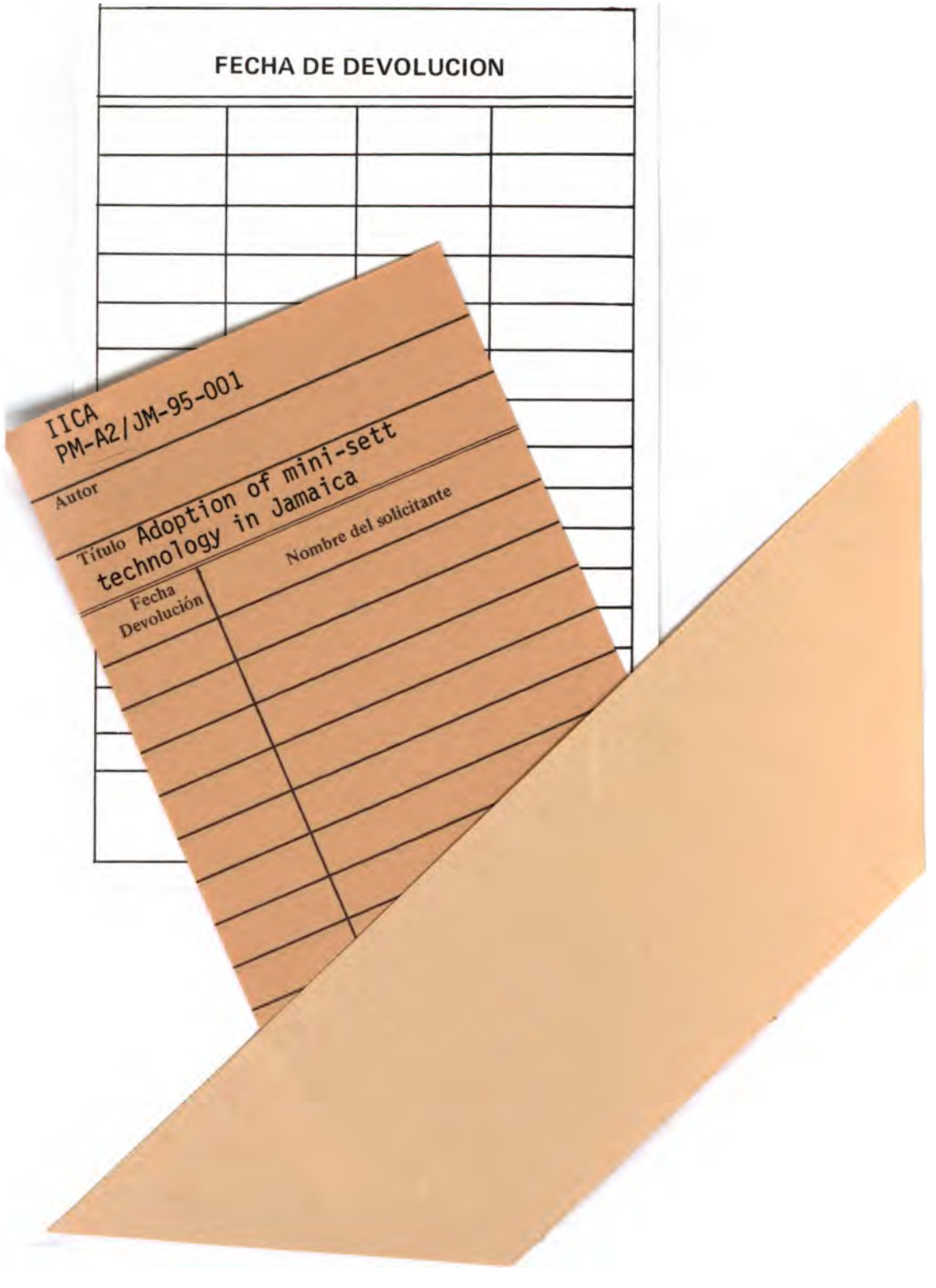
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